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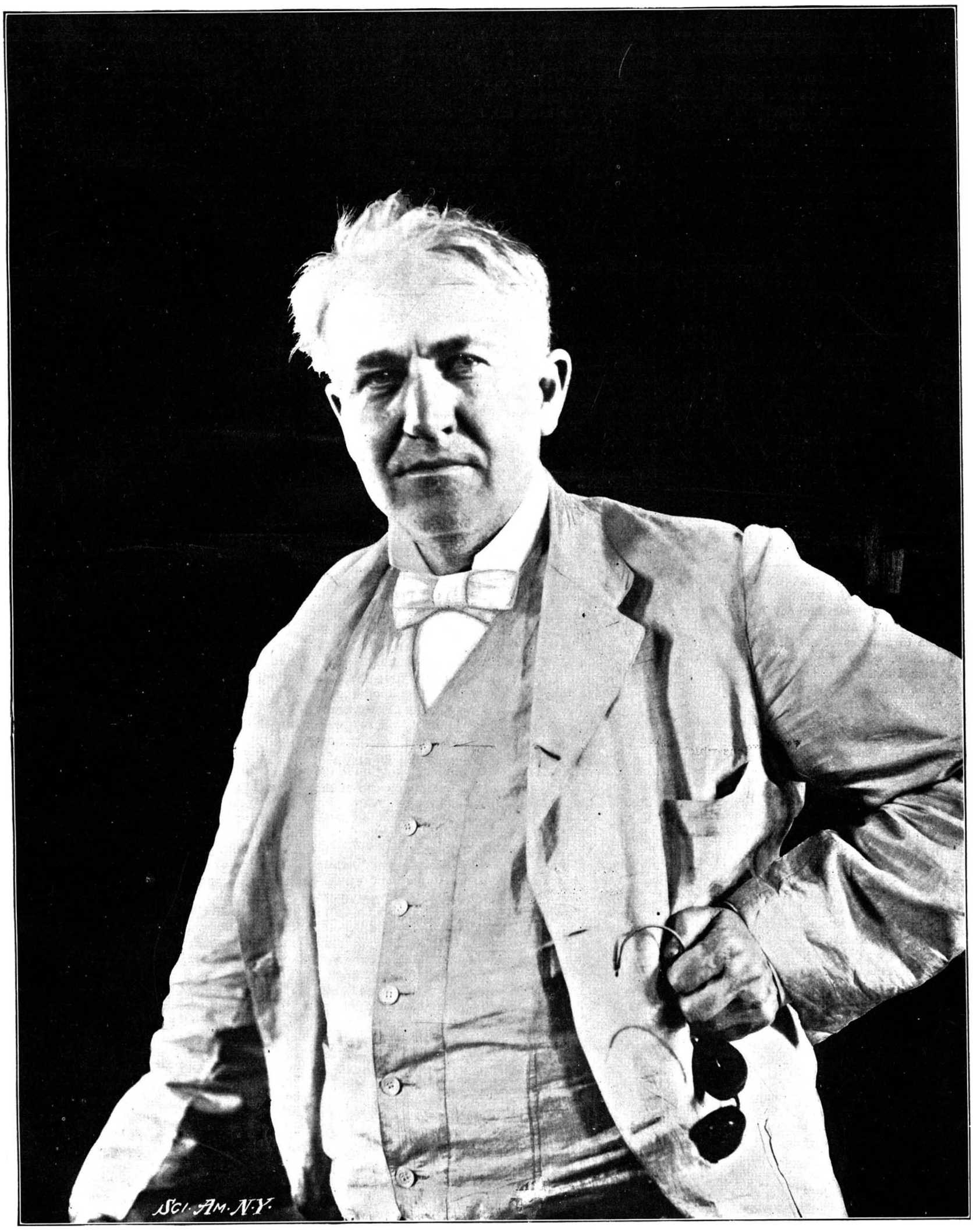

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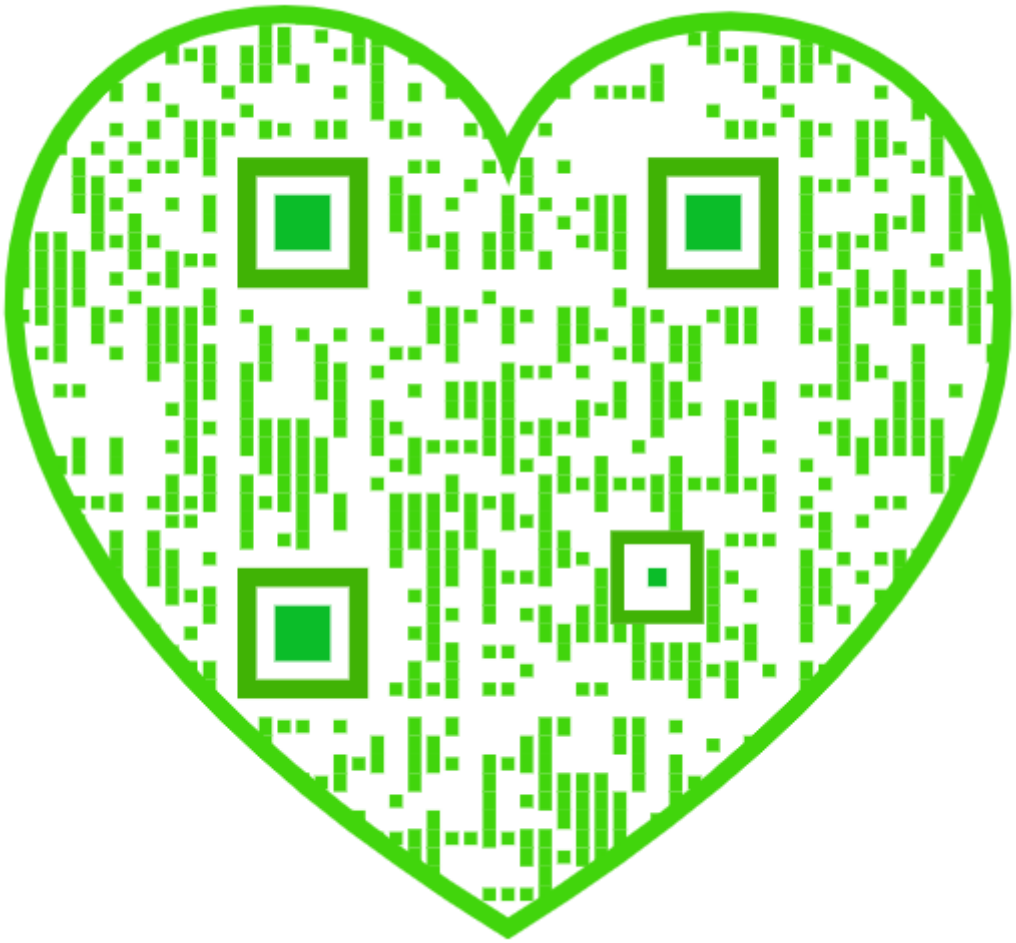

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NEW YORK, SATURDAY, DECEMBER 27, 1902.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

BUILDING AMERICAN LOCOMOTIVES IN BRITISH SHOPS.

A significant event that calls for more than passing notice is the securing by a British firm of a Canadian order for twenty high-class locomotives, to be built from American designs. Hitherto the competition has been between American-built and designed locomotives and locomotives which were English both in design and construction, and the result has generally proved that British locomotive builders were rarely able to promise delivery within several weeks of the date set by their American competitors, while their engines were from 20 to 30 per cent more costly. In explanation of these differences, it has been claimed by British builders that their engines are better constructed and contain more costly materials, and that although their first cost is greater, they are more economical in operation and considerably more durable in service. The order for the Canadian locomotives was secured in competition with American firms, and as the locomotives will be of American design, an opportunity will be presented to see whether the superior economy of operation and the greater durability of English-built locomotives are due to the design or to the workmanship. Of course, it is understood that the operative results will not absolutely settle this question, as there are liable to be various elements entering into the comparison that will prevent any conclusive deductions being made; but it is certain that after the locomotives have been delivered and been operated for a number of months, we shall know a great deal more about this vexed and very interesting question than we do just now.

NAVAL WAR-GAME BETWEEN THE UNITED STATES AND GERMANY.

In view of the rather startling developments just now occurring in South American waters, particular interest attaches to a series of articles from the pen of Mr. Fred T. Jane, which is being published in the SCIENTIFIC AMERICAN SUPPLEMENT. The author of these papers, who is a naval writer of world-wide repute, is the originator of the Jane Naval War-Game, which is being played extensively by the officers of the navies of the world. The object of the game is to approximate, as closely as possible, the conditions which would obtain if an engagement were carried out between the ships of two contending navies. The sphere of operations in playing the game is a large board ruled into squares representing 2,000 yards on a side and smaller squares representing 100 yards, or half a cable, on a side. This magnified checkerboard is used for the actual engagements when two hostile fleets have drawn so close together that they can be contained within the board. Preparatory to the actual conflict, strategical moves are made by each side in six-hour runs, which are carefully plotted by the rival admirals on charts, the courses followed by the opponents being compared by the umpire, who is seated at a central table. When the hostile forces approach within sighting distance, the models of the ships are transferred to the large checkerboard, which is known as the "seaboard."

The ships used in the game are accurate models of the ships of the two contending nations that are in commission when war is declared, and each vessel is maneuvered by a different player who acts as her captain throughout the war. Until the engagement begins, the admirals are allowed to give any directions they please to their captains; but after fire is opened, they may transmit signals only through the umpire, and each captain has to think for himself, and carry out his orders to the best of his ability. Firing is allowed to commence at 8,000 yards, and targets representing the actual ship to be attacked at various ranges and positions, are used. Hits are determined by an instrument known as a "striker;" and when armor is hit, penetration depends, as in actual war, on the nature of the projectile, the range, and the angle of impact. It is claimed by the naval officers who play the game that the actual average of hits works out very closely to actual battle results.

An interesting feature of the war-game is that, in playing it, fleets may be made up, if so desired, each of which contains vessels of different navies and widely different types; or two opposing fleets may be arranged which contain opposite types of design; or, yet again, battleships may be pitted against armored cruisers. Indeed, any combination desired may be made, and valuable lessons learned as to the relative efficiency of different types and the degree to which they are likely to attain the results which were aimed at when they were designed.

Just now a very interesting "war" is being fought out by the Portsmouth (England) Naval War-Game Society between the navies of the United States and Germany. The account of the various battles of this war, illustrated with diagrams representing the positions of the ships in the various stages of the battle, referred to above, is being contributed by Mr. Jane to the SCIENTIFIC AMERICAN, with exclusive rights in this country and in Great Britain. The first of these most interesting papers was given in the last issue of the SUPPLEMENT, and they will appear in successive issues until the war is over.

Directly war broke out, both sides put all available ships in commission. As a rule, this affected the coast defense squadrons (both far removed from the scene of war) and the commerce-attack cruisers which were destined to have an early meeting. The United States Mediterranean squadron was cabled to proceed to the Far East. The South Atlantic squadron put to sea in an endeavor to bring on an action with the Germans in those waters; while the Home fleet cruised up and down the coast awaiting developments. On the German side the first Home squadron went to Gibraltar at full speed, which it reached seven days after the breaking out of war; but by this time the United States Mediterranean fleet was well down the Red Sea. Both sides adopted somewhat similar dispositions for their cruisers. That is to say, there was but little inclination to speed them, their efforts being directed rather to hunting for hostile cruisers than to attempting action against commerce.

In the current issue of the SUPPLEMENT is described a great battle of the hostile fleets which took place in mid-Atlantic, the American fleet consisting of the flagship "Olympia," the commerce destroyers "Columbia" and "Minneapolis," and the cruisers "Raleigh," "Cincinnati," "Detroit," "Marblehead" and "Montgomery." The German fleet was made up of the flagship "Prinz Heinrich," the "Victoria Luise," "Gefion," "Amazone," "Thetis" and "Ariadne." The result as worked out in the game was the defeat of the American fleet, due mainly to the lack of under-water torpedo-tubes, the "Olympia" being torpedoed and captured; the "Columbia," "Cincinnati," "Marblehead" and "Montgomery" sunk by torpedoes; the "Detroit" rendered unmanageable and captured; while the "Minneapolis" and the "Raleigh" escaped. On the German side the damages were that the flagship "Prinz Heinrich" was sunk by torpedo fire; the "Victoria Luise" badly injured by torpedoes; the "Thetis" badly raked by gun fire and scuttled by the Germans; while the "Gefion," "Amazone" and "Ariadne" were cut up by gun fire, several of their guns being put out of action. In the following issue will be a description of an indecisive battle in the Far East, where the Germans had concentrated with designs on one of the outlying islands of the Philippine group.

THE NEW RAILROAD AND TROLLEY TUNNELS ENTERING NEW YORK.

In spite of the strenuous effort made by a certain section of the Board of Aldermen to defeat the Pennsylvania Railroad tunnel grant, the clearly expressed will of the people and the undoubted advantages to be derived from the Pennsylvania Railroad's proposal have carried this important measure through. New York city can now rest assured that before many years have elapsed, it will be in possession of a terminal station that will be commensurate with its needs and in keeping with its importance as the metropolis of the western hemisphere. It is certainly a curious anomaly that for so many years a city of the size of New York should have contained within it only one terminal station. The explanation is to be found in the peculiar geographical features of the site upon which the city has grown up. Surrounded, as it is, on three sides by the broad waters of the Hudson and East Rivers, direct communication by railroad was only possible, at least in the earlier years of railroad construction, from the north; and it was inevitable that the first railroads to enter New York city should come in by way of the Harlem River. The East River, it is true, did not present the insuperable obstacle to a railroad bridge that seemed to exist in the Hudson River to the west; but in earlier years the comparative unimportance of the Long Island Railroad precluded any serious consideration of an East River railroad bridge, while the travel from the New England States by way of the New Haven Railroad obtained entry to Manhattan Island over the tracks of the New York Central Road. With the exception of the systems that use the Forty-second Street terminal, however, New York city has been practically cut off, as far as direct railroad communication is concerned, from the majority of the great railroad systems of the United States; for in spite of the fact that an excellent ferry service had grown up across the Hudson River, it is a fact that the majority of the trunk railroads that serve New York city have their terminals in another city and another State.

Within a few years' time all this will have been changed. The most progressive railroad system in America will have erected in the heart of Manhattan Island the largest railroad station in the world; the problem of railroad bridges across the Hudson and East Rivers will have been solved by the construction of a series of main-line tunnels beneath Manhattan Island, giving a direct trunk line service between New York city and the whole of the United States, and a direct suburban service to the vast residential districts lying to the east and west of New York. The tracks will be carried in two separate 18-foot, tube tunnels extending below Thirty-first and Thirty-second Streets until they reach Seventh Avenue, where the easterly façade of the central station will be located. Here a third track, to extend below Thirty-third Street, will be added, and the three tracks will continue across Manhattan Island under the three streets named, converging below the East River to unite in a single tunnel as they enter Long Island. The great central station with its underground yard will cover more than four large city blocks, including all the space between Tenth and Eighth Avenues and Thirty-first and Thirty-second Streets and between Eighth and Seventh Avenues and Thirty-first and Thirty-third Streets. Altogether there will be in the station 25 parallel tracks, access to which will be gained by a broad causeway, which will be approached from street surface by easy grades at either end of it. The causeway will extend entirely across and above the tracks, with easy stairways leading to the platforms. What might be called the superstructure of the station will contain the waiting rooms, baggage rooms, and general offices of the company, and its architectural features and great size are such that it will constitute one of the most imposing buildings in the city. The construction of this great engineering work, which is to cost, all told, some $50,000,000, will be one of the most interesting works of its kind ever carried on. It will give employment to a vast army of laborers; and in this and other respects will prove of undoubted benefit to the city, even before the general public begins to appreciate the great saving of time and trouble, which will be realized from the very day that the station is open for service.

Concurrently with the granting of the Pennsylvania Railroad franchise, the Board of Aldermen granted a second tunnel franchise, permitting the New York and Jersey Railroad Company to construct a large terminal passenger station on the New York side of the North River at the foot of Christopher Street. The New York and Jersey Railroad Company was organized under the laws of the State of New York to complete the tunnel begun some years ago by the Hudson Tunnel Railway Company. At the present time more than 4,000 feet of this tunnel have been constructed from the New Jersey side, and a gap of only about 1,400 feet remains between the completed end of the tunnel and the New York shore. Active work on the tunnel has been in progress for some months under the supervision of the chief engineer, Charles M. Jacobs, who is also chief engineer for the Pennsylvania Railroad tunnel. The New York terminal station will be in the block bounded by Christopher, Greenwich and West Tenth Streets. The completed section of the tunnel begins in the yards of the Delaware, Lackawanna & Western Railroad, and the Jersey terminus of the tunnel is close to the Erie Railroad's terminus. Probably these circumstances have given rise to the rumor—denied by the railroad companies themselves, but generally accepted by the press and the public—that the Erie and the Delaware, Lackawanna & Western Railroads have an understanding with the New York and Jersey Railroad Company, by which they will be enabled to run their cars through to the New York terminus. If this rumor proves to be true, the closing days of the year 1902 will have witnessed the inauguration of the most important scheme for the betterment of transportation to and from New York city in the history of the metropolis.

During August, Scotch shipbuilders launched 22 vessels, of about 46,882 tons gross, as compared with 19 vessels, of 32,022 tons gross, in July, and 23 vessels of 55,080 tons gross, in August last year. In the eight months Scotch builders have launched 198 vessels, of 338,708 tons gross, as compared with 185 vessels, of 354,826 tons gross, in the corresponding period of last year, and 321,360 tons gross in 1900.

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THE ARMY SIGNAL CORPS.

The efficiency of the Signal Corps men in transmitting messages along the coast during the sham war between the Army and Navy calls special attention to the development of a branch of our Army equipment which has rarely received all the attention it deserves. It was in the American armies during the war between the North and South that the telegraph was first practically applied under war conditions, and some of the experiences gained at that time have been of inestimable advantage in developing a system of telegraphic communications that would be ready for instant use. When the Spanish war broke out the ability displayed by the Signal Corps in covering the whole coast with a system of communication, which would have made it difficult for any hostile fleet to approach without detection, was remarkably gratifying to all those interested in this feature of warfare.

The technical corps of an army is always proportionately small, and the pay for expert electricians has never been high enough in our Army to attract the most efficient men; but through the self-sacrificing endeavor of a few men the service has been enabled to accomplish much in recent years. Unfortunately, Congress has never fully appreciated the importance of the Signal Corps, which has full charge of constructing, repairing and operating military lines, and the funds grudgingly granted for this purpose have been totally inadequate to the actual needs.

The Signal Corps of the Army divides the system of covering the country with telegraphic lines into three divisions. These are the permanent, the semi-permanent, and the flying lines. The first consists of the established commercial telegraph and cable lines which the Army would use in the event of a war, and even take full possession of in an extreme emergency. The semi-permanent lines are those which have a number of stations along the coast equipped with all the necessary apparatus for communicating with other signal stations either by telegraph lines or by wireless telegraphy. The coast is divided up into sections with stations established at convenient points, which in times of peace are practically abandoned except for local watchmen whose business it is to look after the stored apparatus. Several of these stations have been equipped since the war with Spain with all the necessary implements for immediate and practical work.

The third division of the signal system is in some respects the most important. The field or flying telegraph lines must be erected in the very field of operations and often in the face of the enemy's fire. The signal men who operate these must be the bravest and most efficient. The extreme outposts of the Army must be connected with headquarters by some system of signaling. The Signal Corps division in charge of this must devise some means of establishing such communication in an emergency either by laying wires, erecting temporary wireless telegraph stations, or by signaling with flags or other flying objects. In order to accomplish this quickly in the face of the approaching enemy wires must sometimes be laid on the ground or stretched across marshes and creeks and small rivers.

In all field operations the apparatus employed must be of great mechanical strength and accuracy and comparatively simple and light in weight. The field telephone has been found to be of the utmost value in this branch of the service, for messages can be communicated quicker by means of it than by telegraph, while the telephone will often work over hastily constructed wires where telegraphic messages would fail.

The modern flying telegraph and telephone wires can be constructed under ordinary conditions at the rate of one to three miles an hour. The truck used for the purpose has a field searchlight which throws a strong path of light behind or ahead to enable the workmen to see their way on the darkest nights. All complete this truck weighs but 5,300 pounds, and carries sufficient fuel and water for two hours of steady work. A team of strong horses can drag it over an ordinary country; but in the event of the enemy approaching close to the lines, four horses would be assigned to the task to avoid any delay in crossing rough fields and marshes. Besides carrying oil for fuel and water for boiler purposes, the truck has a complete equipment of telephone and telegraph instruments, and a cable reel.

The flying field telegraph and telephone train consists of three sections, and the field searchlight trucks. Each section carries all the material and apparatus necessary to construct from fifteen to seventeen miles of line. There is the wire wagon, the lance truck, and the searchlight and generator truck. The second truck is loaded with four or five hundred lances of well-seasoned cypress or spruce, each a trifle over fourteen feet in length, crowbars, tools, rubber insulators, and similar articles. A preliminary surveying party precedes the lance truck, and pins are stuck in the ground by the surveyors to mark the places for the lances. A working party with crowbars follow next, and they make a hole two or three feet deep in the soil at each pin mark. The lance truck comes immediately in their wake, placing the poles near the holes made with the crowbars, and attaching the insulators on the upper ends.

The wire wagon with its load of wire appears on the field at this juncture, and the workmen slip the wire into the slot insulators and raise the poles to an upright position. The battery wagon then follows equipped with a number of cells to operate the lines, and with a supply of the various types of field telephone and telegraph apparatus. If the line is to be a permanent one more care is exercised in making the work of a substantial nature, and sometimes a second working division follows to improve and amplify the work of the first flying division. Operating stations are established at certain points, and skilled operators are in constant communication with the first end of the newly-laid line, which may in a short time be attacked and destroyed by the approaching enemy. Consequently as fast as the line is laid communication is established and the head division knows exactly what it taking place at the other end and all along the line. The constructing of such a flying line is one of the most interesting and dangerous classes of work that mechanics and electricians can undertake in war time. The enemy is equally alert to the value of such established communication, and scouting parties are sent out ahead to destroy the lines. Often the telegraph operators and electricians must be prepared to defend themselves and their work. Consequently the army electrician and operator is a fighter as well as a mechanical expert. He must enlist as a soldier and become proficient in the use of small arms and military drills and tactics. Where the conditions are peculiarly dangerous, a squad of soldiers follows in the rear of the Signal Corps men to protect them from an attack by the advancing enemy, and the electricians often work away at their appointed task while skirmishing battles are going on all around them. They only drop their tools to take a hand in the conflict when matters get a trifle too warm for the soldiers, and their protecting escort appears to be retreating before an overwhelming number of the enemy.

During our campaign in the Philippine Islands the field telegraph and telephone workmen performed excellent work along the line described, and as fast as the Army invaded new territory, following after the fleeing enemy, the electricians strung their wires over the ground or attached them to trees or insulated lances. They had difficult problems to solve in many parts of the country, for the land alternated between low marshy meadows, thick tropical jungles and rough mountainous country. But through all kinds of scenery and climate the Signal Corps men persistently pushed their way, keeping the rear of the advancing army in touch with headquarters. With the exception of only a few picked bodies of men who went in search of Aguinaldo, the advancing columns never once got far out of touch with the main division, so efficient were the flying telegraph corps of men in establishing lines of communication. G. E. W.

TO OUR SUBSCRIBERS.

This is the last issue of the year—the fifty-seventh of the SCIENTIFIC AMERICAN'S life. Since the subscription of many a subscriber expires with the present number, it will not be amiss to call attention to the fact that the sending of the paper will be discontinued if the subscription be not renewed. In order to avoid any interruption in the receipt of the paper, subscriptions should be renewed before the publication of the next issue. To those who are not familiar with the SUPPLEMENT a word may not be out of place. The SUPPLEMENT contains articles too long for insertion in the SCIENTIFIC AMERICAN, as well as translations from foreign periodicals, the information contained in which would otherwise be inaccessible. By taking the SCIENTIFIC AMERICAN and SUPPLEMENT the subscriber receives the benefit of a reduction in the subscription price.

EUROPEAN SALE OF PUPIN'S TELEPHONE PATENTS.

It is said that Prof. Michael Pupin has sold the European patent rights of his invention for the transmission of telephone messages over long cables to the firm of Siemens & Halske of Berlin. Whether any reliance is to be placed upon the report that he received a half million dollars from the firm for the exclusive European rights cannot be ascertained. No doubt the patents were bought for a large sum. Pupin's system has been exhaustively described in the columns of the SCIENTIFIC AMERICAN. The report made to the firm by its engineer states:

"The experimental tests demonstrate that the insertion of inductance coils into long distance telephonic conductors, in accordance with Pupin's invention, enables us to obtain in practice the enormous effects required, and that long distance telephony actually enters into a new area of development. The problem of transatlantic telephony has become through this invention a possibility, even if the cost of a suitable submarine cable might still be too high and the technical difficulties accompanying the manufacture and laying of a submarine cable with coils in great submarine depths might be considered as exceptionally serious.

"The manufacture and laying of Pupin's cables in the less considerable depths of the Mediterranean, the North Sea and the Baltic offer no difficulty whatever, so that there is nothing in the way of establishing direct telephonic communication between Berlin-London, Berlin-Copenhagen-Stockholm, etc."

SCIENCE NOTES.

Some two years ago, while tending the roots of the vines in a vineyard at Attenburg, Lower Austria, a gardener unearthed the lower jaws and upper molars of a gigantic animal, presumably a rhinoceros, which were taken to the high school at Vienna for further investigation. Prof. Toula closely examined the relics, and recognized from the structure of the teeth that the remains were not those of the ordinary wooly rhinoceros. He immediately repaired to the vineyard, where he continued excavations at the point where the skull was disinterred, and discovered practically the whole of the skeleton of this interesting animal, which has now been mounted. Although a portion of the skull is missing, there is sufficient to show that the beast was of the two-horned species found in Sumatra. The breccia where the skeleton was found is of the Pleistocene age. It also contained the remains of a goat.

Prof. A. L. Rotch, of the Blue Hill Meteorological Observatory, intends to explore the upper regions of the air above the equator by means of kites and balloons sent up from ocean steamers. In this manner Prof. Rotch hopes to study the overlying and anti-trade winds and to make a map of their course. It is only on the peak of Teneriffe that the anti-trade winds can be observed the whole year. Their mean lower limit is at the height of 9,000 feet, and their height is greater in summer than in winter. In October this altitude sinks to 6,000 feet. We know that the anti-trade exists over the trades, at least in the North Atlantic and at the Sandwich Islands, but no one has found this upper current in Central America or in Ecuador, while the smoke of the highest volcanoes around Quito constantly indicates a strong wind from the east. It remains to be seen whether kites or balloons sent up from ocean-going steamers will add something to our very limited knowledge of the anti-trades.

At the recent annual congress of the Swiss Society of Natural Sciences, held at Berne, a new and interesting theory as to the origin of the appearance of the higher atmosphere, which is popularly styled as the "blue sky," was advanced by M. Spring, a well-known scientist of Liege. Hitherto the azure tint has been supposed to be due to the refraction of light upon minute corpuscles disseminated in the air. M. Spring, however, has conceived a new explanation of the phenomenon. He has carried out a number of experiments with luminous rays under almost all conceivable conditions, injecting them into agitated solutions, and into a glass tube, containing pseudo solutions such as chloride of aluminium of absolute limpidity; but although he could obtain red, yellow, violet, etc., under no circumstances could he obtain blue, until by the use of electricity he secured a perfectly pure atmosphere in which blue was clearly discernible. M. Spring therefore concludes that the blue of the sky is purely electrical in origin, and is an essential quality of the air.

Mr. Oscar Neumann, the well-known explorer, has delivered a lecture before the Royal Geographical Society of Great Britain dealing with his journey from the Somali coast to the Soudan through southern Abyssinia. He was accompanied on the expedition by Baron Von Erlanger and Dr. Ellenbeck. The journey was of great scientific value. The party discovered several fossils of Upper Jurassic strata (north of the Wabi), and still more that of cretaceous strata in the Gillet Mountains. They found that the belt of country from Abulkasim and Abu Nas to the Blue Nile, and the headstreams of the Sobat, consists for the most part of tertiary volcanic rocks, the date of the formation of the rift valley —formerly occupied in its northern parts by a great lake basin, as is shown by mollusks found on the Suhsuk River—belonging also probably to the tertiary period. Between Zeila and Addis Abbeba Dr. Ellenbeck made a collection of some 2,500 botanic specimens, and after separating from the rest of the party Mr. Neumann obtained some 200 plants. The zoological collections are the largest that have ever come to Europe from Africa at one time. Mr. Neumann's collection includes 1,000 specimens of mammals, 1,300 of birds, 30,000 of insects, 2,000 mollusca, besides reptiles, fishes, etc. Twelve new mammals and ten birds were discovered.

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Care of Automobile Tires.

Some automobilists complain of continual ill luck with tires, while their friends, using the same makes, will have practically no trouble. The apparent discrepancy is not due to any difference in the quality of the tires, but to the amount of care which they receive. The average motor car driver or mechanic will too often attend to every part of the vehicle but the tires. These he will neglect to keep thoroughly inflated, and perfectly clean, so that mud gets in between the tire and the rim and dries there. This rusts the rim and crowds the tire, while if not kept inflated the tire becomes rim worn and the rim is injured by striking stones and other obstructions. An official of one of the tire manufacturing companies is responsible for the statement that if several well-known automobilists should purchase tires of the same make for identical vehicles, he could foretell almost exactly how long each set would last, on account of his knowledge of the care which the respective cars would receive.—N. Y. Times.

A GERMAN AMBULANCE TRAIN

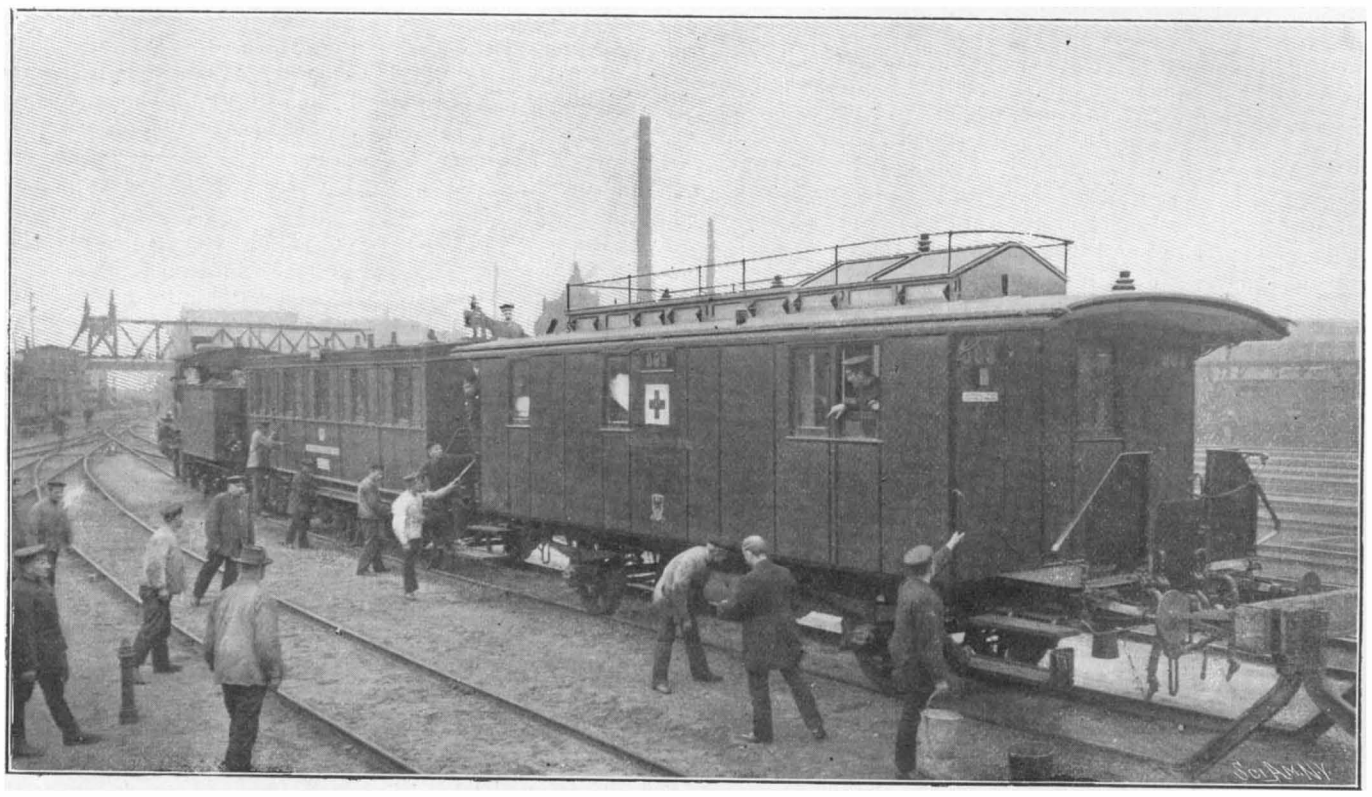
Although it is impossible altogether to prevent railway accidents, it seems at least that something can be done to relieve the sufferings of those who have been injured. Both in America and in Germany, ambulance trains are now in use, which are kept ever ready to be sent out for the purpose of affording speedy relief to the maimed.

The ambulance train of which we present illustrations may well be considered a typical example of what has been done abroad. The train, so far as its narrow limits permit, is as admirably equipped as any modern hospital; its operating-room is fitted up with an operating table, with all the necessary appliances of antiseptic surgery. The ward of this hospital on wheels has eight removable beds, which can be used as litters if need be. Reclining-chairs complete the furniture of the ward.

Every German railroad line has a certain number of these ambulance trains, the road being divided into sections and a train assigned to each. Trains are always sidetracked at a station, ready to be sent out. As soon as news of an accident is received, the water tanks are filled, and the railroad surgeons—who live in the vicinity of the stations—are called by telephone.

Even the fast limited trains must give way to the surgeons, and are sidetracked in order that the ambulance may speed to the scene of the accident.

The admirable system which has been devised renders it possible for the surgeons to reach the injured within half an hour after they have been informed of the accident.



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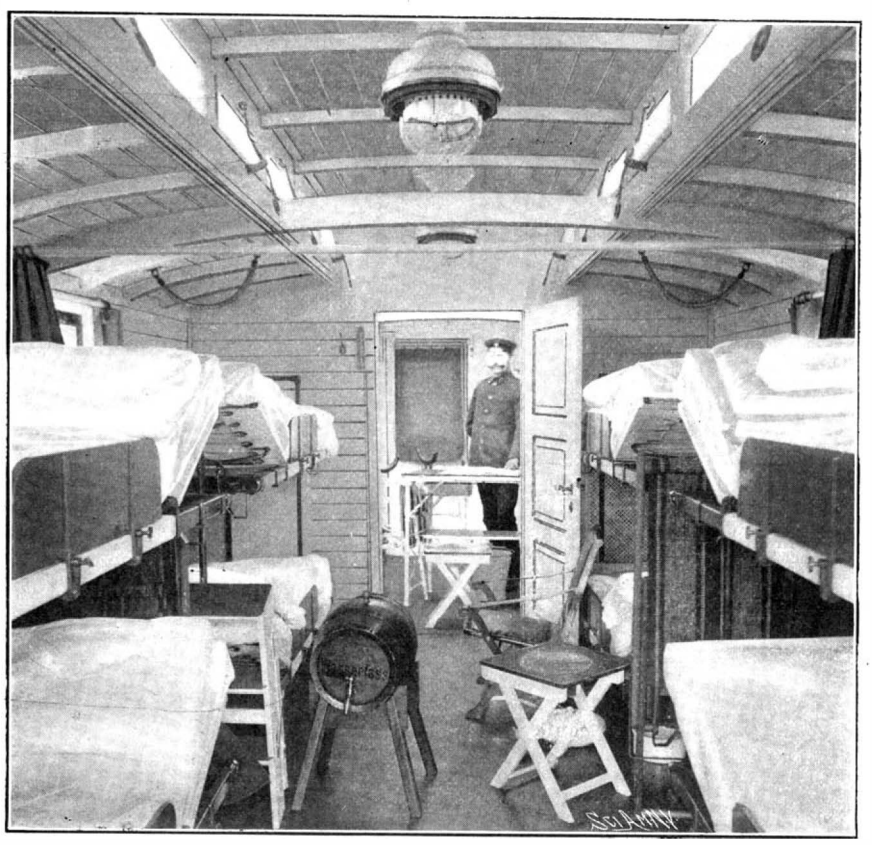

INTERIOR OF HOSPITAL CAR.

OPERATING TABLE.

An interesting project for the purpose of facilitating and developing communication between England and the Continent of Europe is in contemplation. The scheme is to substitute a service of ferries, such as are used in Denmark, in lieu of the present steamboat service between Dover and Calais. The distance from the former to the latter port is 21 miles; and although the sea is at times very rough, owing to the meeting of the waters of the North Sea and the English Channel, it is not more so than the Danish waters where the ferries ply, notably between Malmö and Copenhagen, a distance of 16 miles. A commission, composed of English and French engineers, has been investigating the Danish systems and their ferries, and it is stated that one of the Danish boats is to be loaned for the purpose of experiment between Dover and Calais, to determine if a similar scheme is feasible at this point. The object of such a system would be to run the trains on and off the ferries at the landing stage onto the railroad tracks, thus dispensing with the necessity of embarking and disembarking, by which means great economy in time and trouble would be effected. This system of ferrying has proved a great success in Denmark, so much so, that twenty ferry steamers are now in operation. The vessels are about 300 feet long—approximately the same size as the new turbine steamers now under construction for the Dover-Calais route—and are very similar in design to the ordinary screw steamer except so far as concerns the internal arrangements, where provision is made for the accommodation of a complete train of railroad cars. There are two new boats in course of construction for the Danish ferry service, which are to have a speed of 18 knots per hour, so that they compare very favorably on this point with the orthodox steamships. If the experiment with the Danish ferry steamers proves successful between Dover and Calais, the ferry steamers for this route will in all probability be equipped with steam turbines.

So much is said nowadays on both sides of the Atlantic about the decadence of British shipping, that the recent returns for 1901 issued by the British Board of Trade are interesting reading. According to this government return, British shipping trade with this country last year aggregated 14,426,108 tons, of which 12,626,874 tons were British bottoms and only 479,464 tons American. The whole foreign trade of the United States was represented by a tonnage of 49,680,318, of which 54.4 per cent was British and only 16.1 per cent United States. British shipping on the register was 9,608,420 tons, while the tonnage of this country registered for over-sea trade was 889,129, but there was, in addition, 4,635,089 tons employed upon the rivers, lakes and coasts. The British advantage was still greater if steam tonnage only be considered, 7,617,793 tons for Great Britain, against 2,920,953 tons for the United States. Moreover, the United Kingdom added 773,017 tons to the register, while the United States added only 483,489 tons. The American increase, however, has doubled during the past four years. Furthermore, Great Britain built 207,452 tons for foreigners; the United States built only 14,567 tons.

The new power plant on the American side of the Saulte Ste. Marie is rapidly progressing. It will be much larger in every particular than the plant on the Canadian side.

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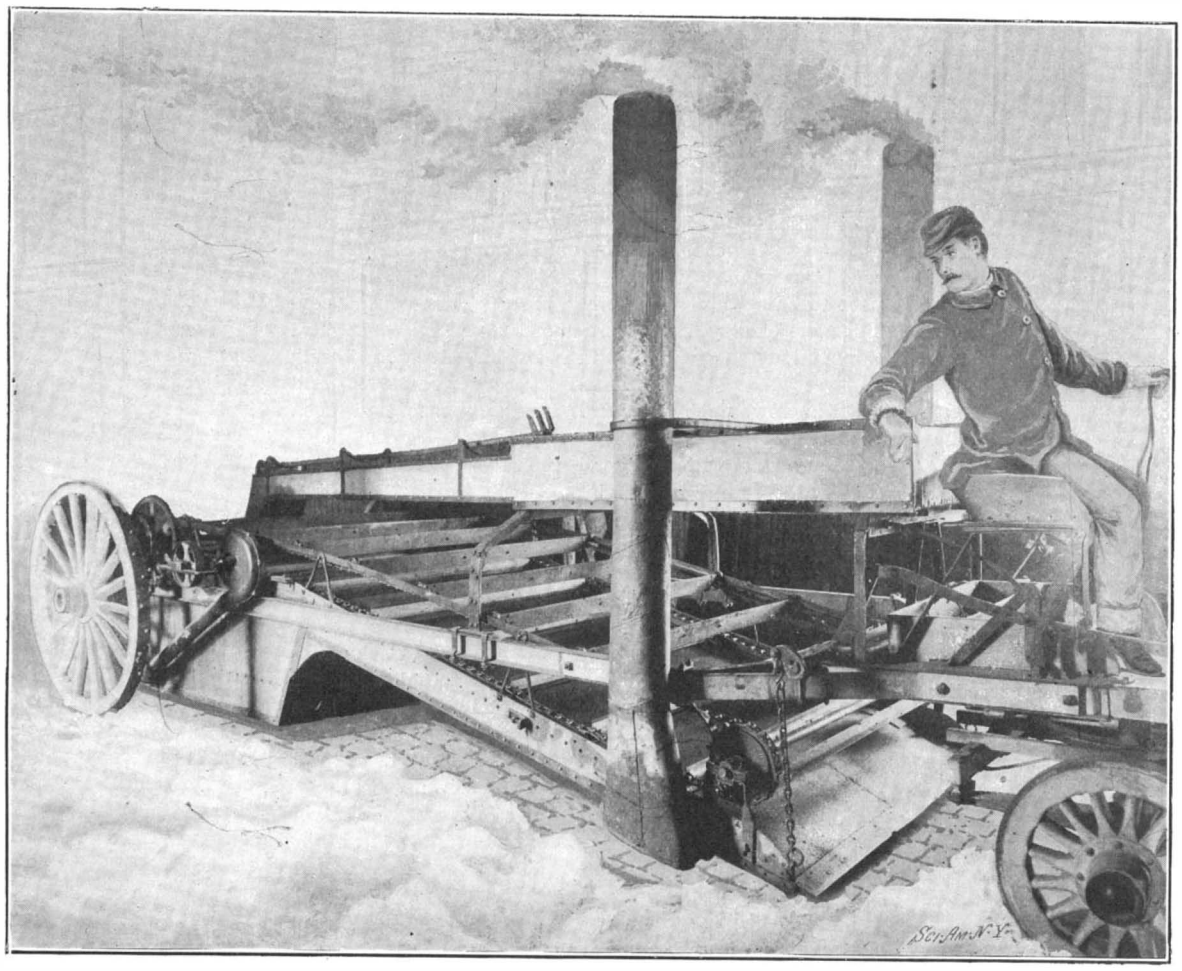
MACHINE FOR REMOVING AND DISPOSING OF SNOW.

While the problem of expeditiously removing snow from our city streets without seriously interfering with traffic is apparent to all, we venture to state that few people realize the seriousness of another problem which confronts the Street-cleaning Department, namely, the disposal of snow thus accumulated. A fall of but a few inches amounts to an astonishing figure when multiplied by the street area of a large city, and the snow gathered must often be carted immense distances before a dumping ground of sufficient capacity can be reached.



MACHINE FOR MELTING AND REMOVING SNOW.

An improved method of surmounting these difficulties is afforded by the machine illustrated herewith, which is designed to scrape up the snow from the pavement and at the same time reduce it to water which flows off into the sewers. To this end the machine comprises a furnace or heater of peculiar shape mounted to swing between the side rails of the frame. The forward portion of this heater is inclined downward and terminates in a shoe or scraper adapted to scrape up the snow as the shoe is drawn along. The shoe may be raised, when desired to prevent it from engaging with the ground, by means of a lever adjacent to the driver's seat and having suitable connection with the forward end of the furnace. The smokestacks shown communicate with the forward end of the furnace, and a forced draft is provided by means of blowers having pipes leading to the ashpit. The snow scraped up onto the shoe is carried along the inclined surface of the furnace by an endless conveyer, and coming thus in contact with the heated surface is immediately melted. The endless conveyers and blowers are operated by chain and sprocket connections with the rear wheels of the machine. Above the conveyer is a coal bin from which a chute leads rearward and is inclined downward, so that the coal may pass to the rear platform when the fireman opens the gate at the end of the shoe. Mr. Jacob Mandrey, of Wakefield, N. Y., is the inventor of this machine.

ELECTRO-MAGNETIC ROTATIONS.

BY HOWARD B. DAILEY.

There is nothing that so adds to the fascination of the study of physical science as an easily tried experiment. Those presented here, illustrating some of the rotational features of electro-magnetism, besides being of great historic interest, are of special value as aids in elementary study in that department of electro-dynamics dealing with the singular natural tendency of electric currents to move across the lines of force of a magnetic field. In 1821 in a series of brilliant experiments in which the illustrious Faraday showed the rotation of a current-bearing conductor round a magnetic pole, with its antithesis, the movement of a magnet round an electrical current, occurred the first utilization of this curious physical principle for the accomplishment of rotary mechanical motion; and in the beautifully ingenious forms of illustrative apparatus employed by him are to be recognized the earliest true examples of electric motors known—the embryonic prototypes of that most valuable and indispensable of mechanical appliances, the perfected modern motor, whose present universal adaptation to the countless uses of the mechanic arts testifies to the immense importance of this great contribution to electrical science. The first figure shows a simple method of demonstrating the phenomenon of current rotation round a magnetic pole. The apparatus is constructed from easily procurable materials, and has the advantage of comprising within itself the voltaic combination for producing the necessary electric current. A plate of carbon from an old dry battery, and a permanent bar magnet of quarter-inch round steel eight inches high are wired into electrical communication at their lower ends, and placed within a tall glass tumbler, the magnet upright in the center, and the carbon against the side of the glass, both being fixed in position with paraffine melted and poured into a depth sufficient to entirely cover all the metallic connection. To give the magnet a firm anchorage in the wax, a piece of sheet metal about the size of an old-fashioned penny is drilled through its middle and forced onto the magnet's lower end and soldered fast. To insure the perfect flow of the wax about the bases of carbon and magnet the operation of pouring should be done with the tumbler standing in a bath of hot water. A strip of sheet zinc one-fourth of an inch wide, shaped like an inverted U, with its two parallel legs about eleven-sixteenths of an inch apart has soldered in the middle of its bend a stiff sewing needle, its point extending downward about three-fourths of an inch and turning freely in a small indentation made in the end of the magnet before tempering. To insure good electrical contact here the needle sets in a small mercury cup formed with a short piece of rubber tubing on the magnet's upper end, care being taken to have the latter and the pivot point bright and clean. Bichromate battery fluid is now poured into the tumbler until its surface reaches a little more than midway between the magnet's two poles, immersing the ends of the zinc to a depth of about an inch, the fluid being prevented from touching the magnet by a covering of snugly fitting rubber tubing extending well down into the wax. It is evident that the arrangement forms a galvanic cell with a part of its closed circuit (the zinc) freely movable. As the poised strip with its current is well within the influence of the magnet's upper pole, it sets up a vigorous rotation about it in a direction depending upon which pole is uppermost. By using a larger containing vessel and two magnets with opposite poles above the fluid, both right and left handed rotations can be shown at once. After some hours running the ends of the zinc will have been eaten off by the acid; if, then, the instrument be desired for further use, new ends having some length so that they can be pushed down as they waste away may be bound on with small rubber bands.

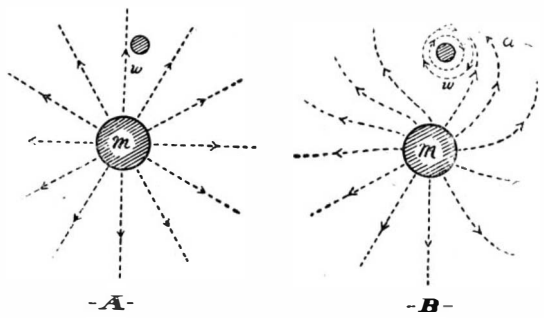


Fig 4.—ROTATION OF CURRENT-BEARING CONDUCTORS AROUND A MAGNETIC POLE.

To one having knowledge of the general significance of the term "Lines of Force," and of the methods of demonstrating their existence and action, the *rationale* of this class of phenomena is not difficult. In the diagram, *A* (Fig. 4), we may regard *m* and *w* as indicating respectively transverse sections of a bar magnet near one of its poles, and of a conducting wire with axis parallel with that of the magnet, the radial-arrow-directed lines representing the normal symmetrical arrangement of the lines of force in the magnetic field, when uninfluenced by the existence of any current in *w*. If, however, we start a flow of electricity through *w*, the conductor becomes the center of a system of lines of its own, which, however, unlike those of the magnet, arrange themselves in concentric circles surrounding the conductor throughout its whole length, these having either a right or left-handed directional sense, according as the current passes up or down in the wire. They are shown right-handed in *B* which represents in a general way the distorted condition of the field which their presence induces. In obedience to Faraday's well-known laws of electro-dynamic action by which lines running in like directions mutually repel, while those having contrary directional paths attract, and where near enough together tend to merge into one another, we find the magnet's lines at the left of *w* bending away and avoiding the wire, because of the similar direction of its own circular lines on that side, as shown by the arrow points. At the right,

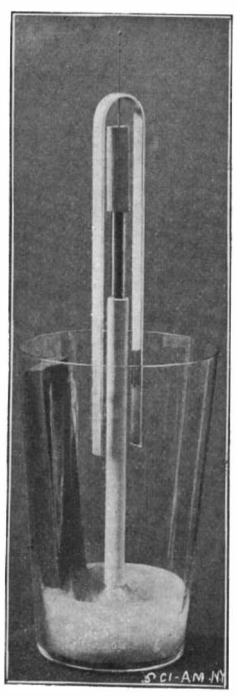


Fig. 1.—SIMPLE ELECTRO-MAGNETIC ROTATOR.

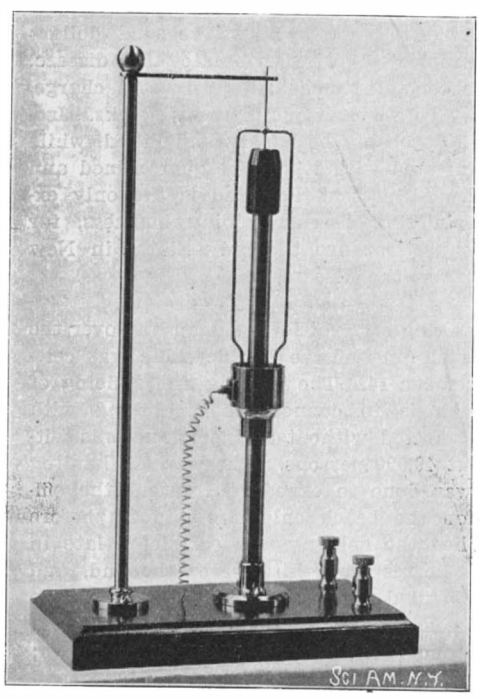


Fig. 2.—REVERSIBLE ROTATOR.

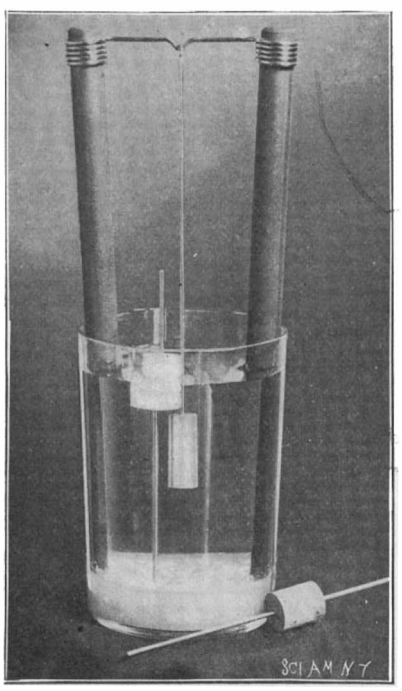


Fig. 3.—ELECTRIC ROTATOR WITH FLOATING MAGNET.

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however, the two systems of lines are running in opposite directions, resulting in mutual attraction, with the coalescence of those of the two sets of lines lying nearest together. Since the magnet's displaced lines are endowed with a sort of elastic tendency to restore themselves to their normal position, those at the left must tend to push, and those at the right to pull the conductor round in the direction of *a*. On reversing the magnet's poles rotation to the left occurs. The reason is easily understood when we remember that lines of force emerging from one pole of a straight magnet, after a curved passage through surrounding space, *re-enter* the magnet at its opposite end; hence, if we would indicate *m* with poles reversed, the arrow-heads on its lines should all point inward, giving a condition exactly the opposite of that illustrated, *w* being now driven to the left. Or, again, left-handed rotation ensues on simply reversing the current in *w* (which would be indicated by reversed arrow-heads on the circles), thus again reversing the directional relation between the two systems of lines. To Dr. Silvanus P. Thompson we are indebted for some striking experimental verifications of the established theories of these phenomena, his beautiful graphic demonstrations obtained by the iron filings method of electro-dynamic observation being of great educational value. *

A neat rotator, convenient for permanent laboratory or lecture table use, is shown in Fig. 2. In this instrument a round magnet of three-eighths-inch steel, eight inches high, carrying at its middle a metallic mercury cup, supports a revolving rectangularly shaped brass wire frame which turns on a mercury-surrounded needle point as in the preceding experiment, the needle being steadied at its upper end in a bearing in the extremity of a horizontal arm at the top of a suitable supporting standard. The open lower end of the frame terminates in two fine points that just graze the surface of the mercury in the lower cup. To prevent the mercury from touching the cup or that part of the magnet within it, the latter are covered thickly with shellac or paraffine. By a wire passing through a small vulcanite bushing in the side of the cup, the mercury is electrically connected with one of the binding posts on the base, the other post being wired directly to the base of the magnet. By changing in the posts the wires from the single cell of dry battery which runs the apparatus the effect of current reversals can be conveniently studied.

The rotation of a magnetic pole round an electric current is easily exhibited with the simple arrangement illustrated in Fig. 3. A pair of arc light carbons nine inches long fixed in paraffine within an ordinary tumbler are joined at their tops with a copper wire from which hangs by a hooked conducting rod a short piece of round Leclanché battery zinc, three-eighths of an inch in diameter. A four-inch length of fine knitting needle strongly magnetized has upon it a little nearer one end than the other a cylindrical cork float half an inch in diameter, its length made as short as is consistent with an ability to support the needle with its upper end about seven-eighths of an inch above the bichromate solution which fills the glass. The zinc, which should not be over an inch in length, should be brought as near as possible to the surface of the liquid without touching the lower end of the cork when the latter and the zinc hanger are in contact, the important object being to get as much vertical distance as possible between the lower ends of zinc and magnets. The zinc hanger, down to where it joins the zinc, and the needle with its float are protected from chemical action by being dipped for an instant in melted beeswax. When placed in the tumbler near the central wire the magnet is attracted to it and swims round it continuously in a direction determined by the polarity of the magnet's upper end. Two needles oppositely magnetized can thus be used to show right and left-hand rotations. As the cork must roll against the wire in its orbital movement, it should be made as smooth and truly cylindrical as possible.

The Scientific American in a Kipling Story.

There is nothing so inspiring to an American abroad, particularly if he be living in some neglected corner of the earth, as the sight of a fellow countryman, or even some American-made article bringing with it vivid recollections of the dear old country and the former happy days. Such a scene is cleverly presented by Rudyard Kipling in "The Captive," which appeared in a recent number of Collier's Weekly. In this story we are gratified to find that the object which brings cheer to the heart of a lonely and unfortunate American is a copy of the Scientific American. The character represented is an inventor who, in order to exhibit and test his new patent automatic field gun, has taken part in the Boer war. Unluckily being on the losing side, he is taken captive by the British, and is found by a visitor in one of the prison camps. Uncommunicative at first, the American immediately breaks his reserve upon hearing the rattle of a newspaper wrapper. His excitement grows when he observes the New York postmark and sees that it is the—"Yes! The Scientific American. Oh, it's good! Can I keep it? I thank you, I thank you."

Fiction though this be, the fact of the matter is that the Scientific American brings cheer to American hearts in every quarter of the globe, keeping our countrymen, the world over, in touch with the advances in practical science for which America is justly famous.

* For an interesting review of Dr. Thompson's experiments with numerous photographic illustrations of iron filings "autographs" of the lines of force, showing their behavior under a great variety of conditions, the reader is referred to Scientific American Supplement No. 161.

Foot and Mouth Disease.

BY R. L. ADAMS.

The disease which has broken out in Massachusetts, especially in the vicinity of Boston, known as the foot and mouth disease (Epizootic Aphtha), is not new to this country. Thirty years ago it caused considerable havoc in Massachusetts, New York, and Connecticut, as well as in Canada. It was finally suppressed and exterminated, at a cost of $3,000, and until a few weeks ago not a single case had been reported in the United States since.

The germs which spread the disease in this last case—first found in Brighton Stock Yards, Brighton, Mass., a few weeks since—may have been brought over from Scotland fens, or some districts of France, or from some foreign country where the disease is prevalent, on some traveler's clothes who had visited one of these places and inspected the live stock, or on the straw or hay packed around articles imported from them. The second herd found with the disease was in Dedham, Mass., and the herd here had contracted the disease from a cow bought at an auction in Concord. The cow proved to be lame, and so it was sent back, but too late to prevent the introduction of the disease and its spreading to the herd. From these places the disease spread rapidly to other places, and there is danger of its spreading still further.

The disease is propagated by germs and is highly contagious. Persons can carry the germs on their clothing or shoes, dogs can transport them, and they can be taken into the systems of a healthy herd which passes over the same road that a sick animal passed over a few hours previous. Cattle are not the only animals subject to it, for it is contracted by sheep, swine, horses, poultry, and sometimes by man. In the latter it comes from drinking the milk or eating the flesh of infected animals, and sometimes by coming in contact with the sores; for instance, the hands coming in contact with the sores on the teats, while milking. The disease has the nature of an eruptive fever, which is easily recognized by the symptoms, consisting of a higher temperature in the mouth, bleeding teats, an erect coat, loss of appetite, and the secretion of "ropy" saliva. Little blisters, about one-half inch in diameter, form in the mouth and various other parts of the body, as on the teats. The animal drivels, and in walking around treads on this saliva, in which the virus obtained foothold when the blisters broke, and gets the sores in his hoofs. The irritation caused by the sores causes the animal to lie down, so that he gets the sores on various other parts of his body. In two or three days the blisters grow ripe, break, and discharge their contents. If a number of these occur in one place, it makes a raw spot and is very irritating. The disease runs its course in ten or fifteen days, and the animal gets well in the majority of cases, although it sometimes proves fatal.

As the germs are carried only on solid matter, no persons are allowed near infected places; and if caught are liable to arrest. Fifty thousand dollars has been appropriated to exterminate the disease, and with such competent men as we have in charge, it will probably be stamped out in a few weeks. Isolated herds will probably be bought and killed, while communities infected with it will be quarantined and traffic stopped. At present Portland is the only exporting place in New England doing business, for Maine and Connecticut are the only States in New England free from the disease.

With the breaking of a bottle of champagne over the shore end, the landing of the Pacific cable was celebrated on December 14. The landing and splicing of the cable which is to connect the mainland with Honolulu was effected without accident, and was witnessed by about 40,000 persons. The work of hauling in the cable was done so expeditiously that the officials arrived on the beach only two minutes before the cable. When the splicing was completed late in the afternoon, horses were hitched to the end, and the cable was hauled through a conduit to the cable station. At the same time a steamer put out to sea five miles, and anchored the cable with balloon buoys; the end was then taken up by a cable steamer and taken aboard. The splicing to the main body was completed during the night.

Correspondence.

How to Waterproof Boots at Home.

To the Editor of the Scientific American:

For the benefit of the readers of your valuable paper who are like myself obliged to do outdoor work during all seasons of the year, and particularly during the winter, when footwear, absolutely waterproof, is of the greatest importance to ward off colds, etc., I have for the last five years used successfully a dressing for leather boots and shoes, composed of oil and India rubber, keeping out moisture and uninjurious to the leather applied, leaving same soft and pliable. To prepare same, heat in an iron vessel either fish oil, castor oil, or even tallow to about 250 deg. F., then add, cut into small pieces, vulcanized or raw India rubber, about 1-5 of the weight of the oil, gradually stirring the same with a wooden spatula until the rubber is completely dissolved in the oil; lastly, add to give it color a small amount of printer's ink. Pour into a suitable vessel and let cool. One or two applications of this are sufficient to thoroughly waterproof a pair of boots or shoes for a season. Boots or shoes thus dressed will take common shoe blacking with the greatest facility.

Charles F. Miller.

Kansas City, Mo., November 5, 1902.

The Keosauqua, Iowa, Water Power.

To the Editor of the Scientific American:

In the revival of the use of water power, which is now used almost exclusively where it can be procured for the manufacture of electricity for commercial purposes, all available water power should be located. There is an undeveloped water power of no mean importance at Keosauqua, Van Buren County, Iowa, forty-five miles above Keokuk at the great bend in the Des Moines River, which at that point is seven hundred feet wide, and in the lowest stage of water at the rapids is five hundred feet wide, with an average depth of sixteen inches, and at the time of extreme high water the river rises only eighteen feet above low-water mark. It is twelve miles around the bend, and the natural fall is thirty feet. The water power can be developed by building a ten-foot dam across the river at the beginning of the bend, and cutting a canal across the bend for a distance of a little less than two miles, the deepest cutting of which would be sixty-five feet, and the average cutting would be thirty-five feet for the entire distance, which would give a fall of forty feet.

This water power has been surveyed by competent engineers, and would have been developed before this, but for local causes, which are now entirely removed.

The natural conditions are favorable for the use of water power, and there is plenty of stone of a superior quality.

There is no question but what the entire power can be utilized as soon as developed, as there are a number of manufacturing concerns who are now using steam. Besides, the people of Iowa are just beginning to build interurban electric railway lines, and can use this power by transmission.

W. A. Duckworth.

Keosauqua, Iowa, October 18, 1902.

The Use of Eyeglasses in Schoolrooms.

To the Editor of the Scientific American:

If one is familiar with the work of school children, stenographers, bookkeepers and copyists, he cannot fail to notice that a large proportion of these are wearing glasses before their time. Excessive use of eyes in ill-lighted rooms or in artificial light, is partly responsible for this, but another cause seems to be generally overlooked, namely, the *horizontal* position of the books and papers they use. In such position, nothing is in focus, and there is a constant strain of the eyes, in the oblique view they get of printed or written page.

The remedy is simple and obvious. Books and papers should be supported in front of the user. Musicians understand this, and support their music on a music rack to the relief of the eyes and shoulders. When others adopt this plan, oculists will still have enough to tax their best skill and effort, but many will defer the use of glasses to mature age.

Joseph Dana Bartlett.

Burlington, Vt.

Marconi Cape Cod Towers.

On the bluff back of Cape Cod, four 250-foot towers have been built for Marconi. The work of construction has been going on for about ten months. The arrival of Marconi at Cape Cod will doubtless mark the beginning of noteworthy experiments. The action of the Italian government in sending the "Carlo Alberto" to Venezuela places Marconi in a most awkward position. He had intended to carry on off-shore experiments in the ship. Now he must abandon work for the time being at least.

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THOMAS ALVA EDISON.

With the commercial introduction of a radically new type of storage battery, public attention is again drawn to the man who has done more than any other in our time to apply electricity to the needs of every-day life. There is not an electrical instrument, or an electrical process now in use, but bears the mark of some great change wrought by the most ingenious of Americans.

Some brief account of Thomas A. Edison, as an inventor and as a man, may not be without interest to the readers of a journal, many of whom are themselves inventors. To those who believe that Edison's work is the product of an inspiration given by nature to but few, the story of the manner in which he achieves success will seem shockingly unromantic. In the genius who works by inspiration Edison has no great faith. "Genius is two per cent inspiration and ninety-eight per cent perspiration," is the incisive, epigrammatic answer he once gave to a man who thought that a genius worked only when the spirit moved him. Yet it must not be supposed that Edison is deficient in imagination. Every great inventor must have something of the poet in him; for without a most lively fancy, he could never see the possibilities of his own creation.

If the limits of this article permitted a discussion of Edison's numerous inventions, the characteristic of commercial utility would be found common to them all. Not being given to scientific rhapsodies, Edison does not concern himself with what may be of service a century hence; he confines himself rigorously to the needs of the present.

Knowing full well that he is probably not the first who has set for himself the task in the performance of which he is engaged, he reads all that is pertinent to his subject in the vast library which forms an important adjunct of his laboratory. Not content with the information gathered from his own shelves, his literary agent is ordered to send him more. If one were to examine a certain revolving bookcase in Edison's study at home, one could foretell what electrical problem is soon to be solved in the Orange laboratory; for in that case are always contained the volumes which interest him most at the time.

After a thorough review of his subject, Edison begins laboratory work—an expert keenly alive to the failures of his predecessors, careful to avoid useless repetitions of old experiments. It is now that the two per cent inspiration gained by exhaustive reading, and the ninety-eight per cent perspiration which he is ready to expend, are applied. Experiments are made; not a few, but hundreds and even thousands. Model after model is built. Failure upon failure is met with, until further effort seems hopeless. Undismayed, Edison performs more experiments, builds more models. Failure spurs him on. At last an experiment is performed or a model made which gives faint encouragement. So far from being elated, he regards the promising result with great suspicion. The failures have been too many; the apparent success after all may be due to an accidental combination of circumstances that may never occur again. Only after the partial triumph has been confirmed by many trials does complete assurance come.

If ever an Edison invention was a product of infinite pains and unflagging pertinacity, it was the electric incandescent lamp. He had read all that could be read of the labors of others to provide a more efficient light. He knew of Starr's work in England and of Draper's in New York with the platinum wire. He had studied what Despretz had done with sticks of incandescent carbon contained in a glass globe exhausted of air and filled with nitrogen. He knew all that was worth knowing of illumination by means of incandescent carbon inclosed in a vacuum. Then he set his wits at work to find out why everyone had failed. Early in the spring of 1877 he began to experiment. First he thought that a carbon filament might be made out of cotton thread. Five hours were spent in carbonizing a thread. The frail black filament obtained crumbled at the touch. Attempt after attempt proved hopeless. At last a carbonized thread was rescued intact from the furnace; and that, as bad luck would have it, broke in the mounting. For days no further progress was made. He locked himself and his assistants in his laboratory, vowing that neither he nor they should open its doors until he had produced an operative incandescent lamp. After repeated mishaps and incessant testing, a lamp was completed which burned for days before its light expired. Then, and not until then, did he and his laboratory assistants rest. Every imaginable substance was now tried in the effort to devise a perfect filament—iridium, platinum and all the metals, threads rubbed with coal tar, plumbago, South American fibers, monkey-bast fiber, Manila hemp, South American bast, whitewood, palm leaf, paper of all kinds, jute, cardboard, bamboo, and a host of other substances. After thousands of tissues and threads had been tried, it was finally determined that vegetable fibers produced the best filaments.

He had now to determine what vegetable fiber best suited his purpose. A man was dispatched to China and Japan with orders to test the native bamboos. Another explored the Amazon for fibers, suffering untold hardships and tasting no meat for a hundred and sixteen days. A third was sent around the world, with instructions to search Ceylon in particular, from the north to the south and from the east to the west. The whole globe was scoured. Finally the explorers brought back some eighty varieties of bamboo and three thousand specimens of vegetable fibers. Of all these, only three or four were found available.

Trial after trial was made to determine what shape of bulb should be adopted; what particular quality of glass should be used; what was the most effective way of exhausting the air, and what was the simplest method of sealing the bulb. And even after these tasks had been performed, it was necessary to devise a means of generating a current of the proper character.

In all this there is no guessing, no trusting to luck. Edison knows exactly what he wishes to accomplish, and how his end is to be attained. Absolute certainty of purpose and of method saves him from frittering away his time in useless experimentation. Chance has given perhaps an occasional idea, but it has not lightened his work. A device, whose invention he himself has attributed to accident, is the phonograph. He had taken out a patent on a telegraph repeater, in which a chisel-shaped stylus indented a sheet of paper curled around a cylinder. These indented marks were to be used in retransmitting the recorded message. "While singing into the mouthpiece of a telephone, the vibrations of the voice sent the fine metal point into my finger," he tells us. "That set me to thinking. If I could record the movements of the point and send it over the same surface afterward, I saw no reason why the thing would not talk. I tried the experiment first on a strip of telegraph paper. I shouted 'Hello! hello!' into the mouthpiece, ran the paper back over the steel point, and heard a faint 'Hello! hello!' in return." Then he decided to make a talking-machine. The men in the laboratory laughed at him. In the end he proved that he was right.

When the first operative phonograph was completed, Edison packed up his instrument and came to the office of the SCIENTIFIC AMERICAN. Without ceremony he placed the machine on the Editor's desk and turned the crank. The machine introduced itself. "Good morning," it said. "How do you do? How do you like the phonograph?" And thus it happened that the Editors of the SCIENTIFIC AMERICAN constituted the first public audience that ever listened to the phonograph.

The story of the incandescent lamp is repeated in Edison's invention of a method of electro-magnetically concentrating ores. The system has been so fully described in these columns that a detailed description is hardly necessary.

About the latter part of 1897 Edison devoted his exclusive attention to the invention of a new storage battery, on which problem he had been engaged for some five years. For over a year he worked harder than a day laborer. He was at his laboratory at half-past seven in the morning. His luncheon was sent to him. In the evening he left for dinner, but returned at eight. At half-past eleven at night his carriage called for him; but often the coachman had to wait for three or four hours until the inventor came out of his laboratory. Yet despite all this labor, no apparent progress was made for months.

When vacation time comes, and with it a chance to leave his laboratory, Edison plays just as he works, with his whole heart and soul. He will hear nothing of business. Science is thrown to the winds. Letters sent to him from the works are utterly disregarded. Only a telegram of the most imperative nature will command his attention. And so it is with the little relaxation which he permits himself during his work. His hours of rest are few; yet his short sleep is sounder and more refreshing than that of many whose enterprises are of less pith and moment.

Of Edison's personality much might be written. When you meet him for the first time, you feel immediately at your ease—he is so unaffected and cordial. Then, if you are a newspaper man, you begin to study him out of the tail of your eye. He is neither tall nor short, stout nor thin. His white hair makes him seem older than he really is; he is only fifty-six. His face is clean shaven—the mouth firm, the chin strong. In his dress he is careless to a degree. If you are fortunate enough to have him pilot you through his laboratory, you will find it no easy matter to keep up with his quick step. He is nervously active; everything he does is done quickly, yet not hastily. He explains things tersely and clearly. You talk to him; you notice that he is somewhat deaf, and you wonder why this man of all men, should not resort to some invention that will enable him to hear better. But he looks upon his deafness not as a misfortune. Eminent specialists have told him that he can be cured; but he has assured them that he prefers not to be treated, arguing shrewdly that if he could hear the noises which have been so long muffled, he might find it more difficult to concentrate his mind on his work.

Some day a patient Boswell will lovingly intersperse in the chronicle of Edison's life-work many a tale of his delicate sense of humor. If there is one thing that Edison loves, it is a rollicking story. Many a black hour in the laboratory has been brightened for his assistants by his keen wit and sparkling repartee. Occasionally the outer world hears his scientific opinion expressed in some playful sarcasm. When asked once by a New York State official what was the best method of electrocuting murderers, he gave vent to his deep-rooted opposition to capital punishment in the bantering retort, "Hire out your criminals as linemen to the New York electric lighting companies." Then he began an exhaustive investigation which finally revealed the quickest and most painless method of electrocution. Every man in the laboratory who hears a good joke or a clever remark feels it his duty to repeat it to the "Old Man," as Edison is affectionately called in the shops.

His laboratory and his plant are not so much a place of business as a school of scientific invention, of which he is the master. Indeed, he has ideas of business which a Wall Street man might charitably call eccentric. Nowadays his business affairs are conducted by able men. But in the days when he built his first plant at Newark, and when the actual work of keeping accounts devolved partly on him, he conducted his financial affairs in a picturesque, nonchalant way. "I kept only pay-roll accounts, no others," he assures us; "received the bills, and generally gave notes in payment. The first intimation that a note was due was the protest, after which I had to hustle around and raise the money. This saved the humbuggery of bookkeeping, which I never understood. The arrangement, besides, possessed the advantage of being cheaper, as the protest fees were only one dollar and a half. Notwithstanding this extraordinary method of doing business, everyone was willing to accept the notes and my credit was good." The hours of work were just as erratic. "We had no fixed hours, but the men, so far from objecting to the irregularity, often begged to return and complete certain experiments, upon which they knew my heart was especially set."

Like all successful men, Edison has his enemies. He has been accused of appropriating the work of others as his own. There is a rumor abroad that he employs a number of brilliant young men, whom he pays handsomely to work out his ideas, and that it is they who really ought to be credited with the invention of many devices that bear his name. That he is dependent to a certain extent upon the help of assistants is undoubtedly true. Nature has given him but a single pair of hands and a single head. In his laboratory the help which he receives consists largely in the performance of tasks too multifarious for a single man. Something more than a bare idea to work with is given to each man in the laboratory. He is told exactly how the result desired is to be attained. In other words, the men in the laboratory are intelligent human tools in Edison's hands. To him alone is due the invention of the many contrivances with which his name will ever be associated.

The Current Supplement.

The current SUPPLEMENT, No. 1408, opens with a description of some electric freight locomotives. By far the most important article in the number is the first of a series of installments by the English correspondent of the SCIENTIFIC AMERICAN on water-tube boilers. The French revolutionists provided the world with a decimal system of weights and measures, but they were not farsighted enough to provide a decimal system of time. The problem of extending the decimal system to the measurement of time has been taken up by M. De Sarrauton who has devised a most ingenious decimal registering chronograph described in the current SUPPLEMENT. Mr. E. H. Foster tells much that is of value on superheated steam. The Ionic volute has for centuries been an æsthetic mystery to architects. How it was formed has never been quite discovered. F. C. Penrose gives some information on the origin and construction of the volute. Some types of French electrical elevators are described in an article that will be found of interest to engineers familiar only with American practice. Another electrical article of some importance is Mr. G. Paul's study of surface contact systems. "Modern Methods of Underground Wire Rope Haulage" forms the subject of an entertaining article.

It has been unofficially stated that at the approaching automobile show, to be held next month (January), the storage battery of Thomas A. Edison will be shown in its completed form, and it will be announced that the device is ready to be placed on the market commercially. Three machines equipped with these batteries have been in daily operation on the roads of New Jersey, around the Edison works, for some time and one has done a century every day.

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SPECTRAL PHOTOGRAPHY.

BY THE LATE GEORGE M. HOPKINS.

Probably the oldest method of taking a spectral photograph is to expose the plate for a brief period, in the camera, with a skeleton, or person in ghostly apparel, some hideous monster, or even a large bunch of flowers as a subject, afterward using the same plate again in the camera, upon the subject to be taken, with the spectral images, and then developing the whole plate, at one operation.

Another method of producing spectral photographs is to make a very thin positive image on glass, of the same size as the plate to be used in producing the spectral photograph, then placing the plate in the holder, as usual, with the weak positive superposed, and making the exposure through the positive, thereby giving on the negative plate, along with the person, a ghostly image of any prearranged subject. This is a very good way of producing a ghost picture; but it is liable to detection if the same weak positive is used the second time.

Another method of producing such images is to paint in outline on the background the figure desired, by using a solution of quinine sulphate. The image when dry is invisible to the eye, but is capable of producing an image on a sensitive plate.

In some recent experiments still another method of producing spectral pictures was discovered. This method, together with a specimen, is illustrated in the accompanying engravings. It consists in supporting a mirror in front of the photographic lens, which is smaller in diameter than the lens, so as to cause an image of an object, at one side of and at right-angles to the axis of the lens, to be reflected into the camera, and produce an image simultaneously with the image of a person or object, the same being formed by the marginal rays, which pass to the photographic lens, around the edges of the mirror. The mirror being entirely out of focus does not appear on the photographic plate. By this very simple contrivance combined images of various objects may be made upon the same plate.

The amount of light reflected into the camera by the mirror is regulated by the distance of the latter from the lens, and the marginal rays which enter the lens may be regulated by the diaphragm. The apparatus required for this experiment is very simple indeed. It consists simply of an apertured plate, slipped over the lens, and clamped between the lens and the collar. This plate is bent at right angles, and the horizontal arm is slotted. In the slot is placed a screw, having a shoulder which is clamped against the plate by a milled nut. The head of the screw is slotted, and provided with a clamping screw, for holding a downwardly projecting wire, to which is attached a small mirror by means of beeswax. The wire should be provided with a coat of dead black varnish, to prevent it showing on the plate. The mirror should be varied in size to suit the lens to which it is applied. In the present case it consists of a silvered microscope slide-cover ⅝ inch in diameter, and about 1-200 of an inch thick. Thin glass is used for this purpose to avoid the forming of a double image of the specter. The simplest way to silver the slide cover is to scrape the amalgam from a small piece of looking-glass, leaving a disk the size of the glass to be silvered. By placing a minute drop of mercury on the disk and allowing it to remain a few minutes the disk may be slid from the piece of looking glass to the thin cover glass. If the transfer is successful it is allowed to remain for a few hours and then varnished with shellac varnish. If too much mercury has been used, the surplus can be taken up by means of a thin piece of tinfoil applied to the back of the mirror, which is allowed to remain.

By a little practice in the adjustment of the mirror and shutter, the proportionate amount of light for the specter and for the subject may be regulated. The object representing the specter is mounted on black cloth, preferably black velvet, so that no other object than the specter will be represented by reflection.

A screen may be placed between the sitter and the specter, so that the delusion may be made complete. By folding the screen over the specter when it is not in use, the litter will be concealed, so that by careful manipulation, the trick will not be discovered by the sitter.

To Separate Adhered Postage Stamps Without Destroying the Paste.—It is often desired to separate postage stamps that are stuck together without destroying the paste, so that they can be used without another application of paste. This can be done by dipping the stamps in water for a few seconds (not as long as is usually done), shaking off the excess of water, and heating with a match as much as possible without burning. The heat expands the water between the stamps and separates them. so that they can be easily pulled apart, and are ready for use.—W. L. S.

THE NEW ARMORED CRUISERS "TENNESSEE" AND "WASHINGTON."

The two new armored cruisers, the "Tennessee" and "Washington," which are to be built by contract, will have a speed of 22 knots, the same as for the "Maryland" and "St. Louis" classes of armored cruisers now building, and one knot in excess of the designed speed of the earlier armored cruisers, the "New York"

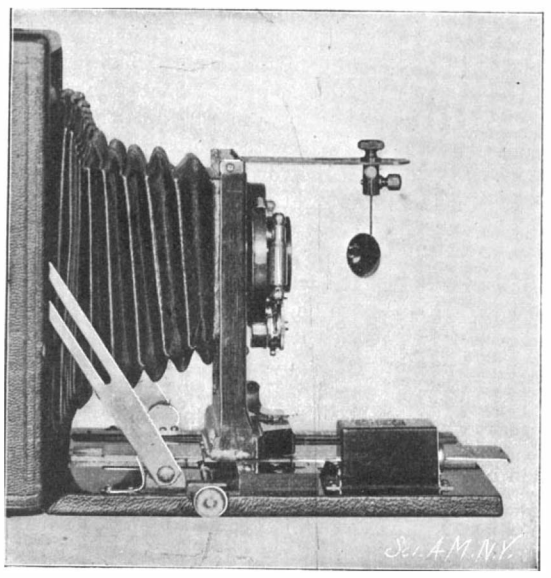

Fig. 1.—MIRROR FOR PRODUCING SPECTRAL IMAGES.

and "Brooklyn." Although they will be slower than many foreign modern cruisers, the "Tennessee" and "Washington" excel in battery power and protection any armored cruiser built, building, or designed, and they are the equal of many of the battleships of the world. With the high protection and battery, it may be asked in what respect these vessels differ from a battleship. It may be stated that they bear the same relation to the battleships as the cavalry does to the infantry in the army. With four knots greater speed than the vessels of the "Connecticut" class of battleships, they are able to move more quickly from point to point, and with their excess of speed over the battleship, they are able to give battle or run away from the enemy's battleship as they please; and with their powerful offensive and defensive qualities, they are able, in case of necessity, to put up a stiff fight with the finest battleship afloat. As compared with the "Maryland" class of armored cruisers now building, there is increased protection to the gun positions by the installation of splinter bulkheads, greater isolation of the 6-inch gun positions being thus secured. Of the twenty-two 3-inch guns which are carried, only six are without full protection, and even these are placed in casemates forward and aft on the gun deck and protected in front by two inches of nickel steel.

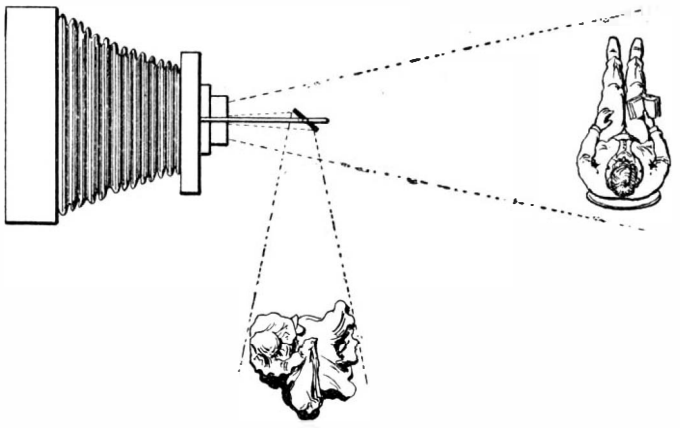

Fig 2.—ARRANGEMENT OF SPECTER, MIRROR AND SUBJECT.

Fig. 3.—A GHOST STORY.

The battery power has also been greatly increased by the substitution of four 10-inch guns on the new vessels in place of four 8-inch guns on the "Maryland" class, the relative perforating power of the 10 and 8-inch guns through Krupp armor by cap projectiles at 3,000 yards being in the ratio of 15 to 10.3. The number of 6-inch guns has also been increased from fourteen on the "Maryland" class to sixteen on the "Tennessee" class.

The general features and dimensions of these vessels are as follows:

Length on load waterline	502 feet
Breadth, extreme, at load waterline	72 feet 10½ inches
Displacement on trial, not more than	14,500 tons
Mean draft to bottom of keel at trial displacement	25 feet
Maximum displacement, full load condition, with coal bunkers full, full supply of stores, ammunition on board, and water in boilers	15,950 tons
Mean draft at maximum load	27 feet
Coal carried on trial	900 tons
Total coal bunker capacity	2,000 tons
Steaming radius at 10 knots per hour, about	6,500 knots
Steaming radius at full speed, about	3,100 knots
Appropriated for hull and machinery	$4.659,000

The trial of the vessels will be conducted on the normal displacement of 14,500 tons given above, and a draft of about 25 feet, the vessel being supposed to carry, in this condition, the normal supply of coal given above, and two-thirds supply of ammunition and general stores. The hull is to be of steel, with the usual cellular subdivisioning of the double bottoms and the hull spaces.

The freeboard of these vessels at the line of the main deck is about 18 feet amidships, 24 feet forward, and 21 feet 6 inches aft; and, of course, increased in wake of the superstructure, which extends to the upper deck.

The hull is protected by a 5-inch belt of armor extending from 5 feet below the normal waterline to the upper deck in wake of 6-inch guns; this armor extending completely to the bow and stern near the water line to form a waterline belt, being reduced in thickness at the ends to 3 inches. Extending from the gun deck to the protective deck are bulkheads of 5-inch armor which form the forward and after limits of the belt armor. Between the gun and berth decks are similar bulkheads located in wake of the 10-inch barbettes which are fitted on the gun deck and form the forward and after limits of the side armor between the main and gun decks. Above the gun deck in wake of the 3-inch battery, 2-inch nickel steel is fitted. The 6-inch guns on the gun deck are isolated by splinter bulkheads of 1½-inch nickel steel, extending continuously across the ship, and 2-inch nickel steel extending fore and aft.

The 10-inch turrets are protected by 9 inches of armor on the sloping face, 7 inches of armor on the sides, 5 inches in the rear, and with top plates of 2½-inch nickel steel. The barbette armor is 7 inches thick in front, reduced to a thickness of 4 inches at the back and below the gun deck, where protected by the belt and casemate armor. The protective deck, which extends from bow to stern, will be 1½ inches thick on the flat over the engine and boiler spaces, 4 inches thick on the slopes at the side, extending down to the bottom of the belt armor, 3 inches on the slope, forward and aft. A cofferdam 30 inches thick will be worked from end to end of the vessel between the protective and berth decks.

The armament will be as follows: Main battery: Four 10-inch breech-loading rifles, sixteen 6-inch breech-loading rifles. Secondary battery: Twenty-three 3-inch rapid-fire guns, twelve 3-pounder semi-automatic guns, two 1-pounder automatic guns, two 1-pounder rapid-fire guns, two 3-inch field pieces, two machine guns of 0.30 caliber, six automatic guns of 0.30 caliber.

The 10-inch guns will be mounted in two elliptical, balanced turrets protected by armor as described above, and they will be under complete electrical control, as will also be their hoists and their loading and training mechanism. The 6-inch guns will be mounted four in independent, armored casemates on the main deck, the remainder in broadside on the gun deck, all on pedestal mounts, the back and side plates of the casemates on main deck being of 2-inch nickel steel. At each end of the vessel four of the 6-inch guns can be trained directly ahead or directly astern respectively, so that it is possible to obtain a direct-ahead fire with the main battery of two 10-inch and four 6-inch guns, and the same number at the stern. The 3-inch guns will be mounted as follows: Six in sponsons on the gun deck, six in broadside on the gun deck, and ten in broadside on the main deck. The 3-pounders and smaller guns are mounted on the upper deck, bridges, in the tops.

The ammunition and shell rooms are so arranged that about one-half the total supply of am-

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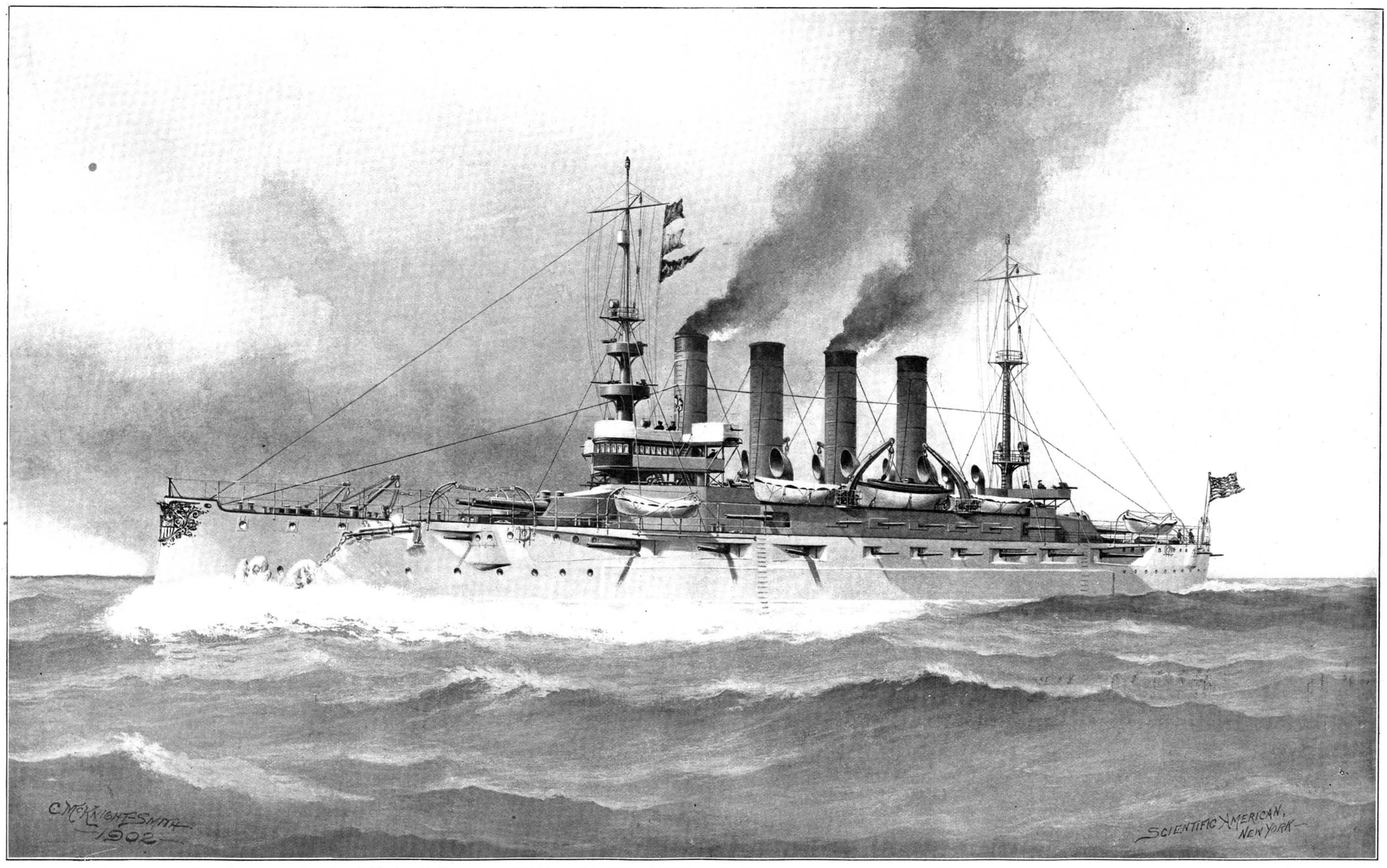

Length on Waterline, 502 feet. **Breadth,** 72 feet 10½ inches. **Speed,** 22 knots. **Displacement on Trial Draught of 25 Feet,** 14,500 tons. **Displacement on Maximum Draught,** 15,950 tons. **Armor:** Belt, 5-inch: central battery, 5-inch; bulkheads, 5-inch; main turrets, 9-inch; barbettes, 7-inch; deck, 1½-inch on flat, 4-inch on slopes. **Armament:** Four 40-caliber 10-inch; sixteen 50-caliber 6-inch; twenty-two 50-caliber 3-inch; twelve 3-pounder semi-automatics; 14 small guns. **Complement,** 858.

THE NEW ARMORED CRUISERS "TENNESSEE" AND "WASHINGTON."

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munition will be carried at each end of the ship. With the increase in battery, special care has been required in developing these designs to secure an adequate rate of supply of ammunition from the magazines to the guns. For handling 6-inch and 3-inch ammunition, the ships have been provided with a central passage extending completely from the forward to the after magazines, and four side passages at each end to extend a sufficient distance forward and aft to provide for handling the ammunition within the armor protection, on the decks above. All of these passages are at the level of the upper platform deck, and such quantity of both 6-inch and 3-inch ammunition is stowed at this level as would probably be required in any action. The remaining ammunition is stowed where it can readily be whipped up by hand when time is available, from the lower to the upper platform.

For handling ammunition along the central passage, there will be ammunition conveyors, which are nothing more than traveling platforms, onto which ammunition can be loaded at one end and delivered abreast the various ammunition hoists at different points in its travel. Provision has been made by means of power hoists, to handle the 6-inch, 3-inch, and 3-pounder ammunition at the rate of seven pieces per minute. In addition to the power supply, there has been provided sufficient means for a supplementary supply of ammunition by hand, to interfere as little as possible with the power handling, so that, with the combined means of supply, it will be possible to supply ammunition to all of the guns at a rate equal to that at which they can be fired.

The full complement of the vessels, as flagships, will consist of: One flag officer, one commanding officer, chief of staff, 19 wardroom officers, 12 junior officers, 10 warrant officers, 814 men.

The masts will be fitted for the installation of wireless telegraphy.

The propelling engines will be of the vertical, twin-screw, four-cylinder, triple-expansion type, of a combined indicated horse power of 23,000. The steam pressure will be 250 pounds, and the stroke 4 feet.

The engines will be located in two separate watertight compartments. Steam, at a working pressure of 250 pounds, will be supplied by sixteen boilers of the straight watertube type, placed in eight watertight compartments, having combined grate surface of at least 1,590 square feet, and heating surface of at least 68,000 square feet.

LEADING TYPES OF 1902 FRENCH LIGHT-WEIGHT AUTOMOBILES.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The following descriptions of some of the French light-weight cars that have become prominent the past year, may be of interest to many of our readers. We have given considerable space to the description of the Renault car, as this deserves special mention, since it won the Paris-Vienna race last summer, thus proving the enduring qualities of a light-weight machine in a hard and rapid road test, and demonstrating that its staying powers equaled, if not surpassed, that of the heavy, locomotive-like car, that had heretofore been so prominent in France.

This machine has been designed especially to secure lightness and simplicity in the mechanism, combined with a sufficient motive power. Its design has been carefully studied, and it is no doubt due to this fact that it has proved so successful. The general arrangement of the parts will be noticed in the plan view of the frame, and in the different photographs. The motor, which is mounted in front, is, however, larger than the one shown; it is of the upright 4-cylinder type, and has been newly designed. The cylinders are mounted in pairs, as usual, upon a long aluminium crank case. The motor develops 24 horse power, and weighs 286 pounds, including the flywheel and friction clutch. The inlet and exhaust valves are superposed; the former are automatic, while the latter are operated from a cam-shaft. The front view shows the relative position of the motor and the water-cooling system. A large water-jacket surrounds the motor cylinders and valve chambers, and is closed at the top, for each pair of cylinders, by an aluminium cap which receives the water-tube. The water tank is of small dimensions, and is placed above and behind the motor. The radiating tubes are placed on each side and partly inclose the motor. The water circulation is carried out on the thermo-siphon principle, which is coming into use in France. The water circulates by gravity alone, the heated water coming from the top of the motor rising to the upper reservoir, from which it descends again through the cooling tubes, and enters the motor at the lower part. In this way the use of a water-pump is not necessary.

The carbureter is of the float-feed atomizer type The admission of gas is regulated by a governor on the motor, and also by a pedal adapted for the purpose, whose position may be fixed by a thumb-nut placed just below the steering wheel. During stops or long descents, the motor speed may thus be reduced to less than 400 or 500 revolutions per minute, or the motor may be stopped. The quantity of air entering the carbureter is also regulated, according to the speed of the motor, by a small handle placed beside that of the ignition shifting one. The method of electric ignition deserves mention, as the new system designed by M. Carpenter is employed. The spark-break is made much more quickly than usual. The trembler of the induction coil, instead of breaking contact directly, when it is attracted, does not do so until nearly at the end of its movement, when at the maximum speed; at this point it strikes against an auxiliary contact spring, making a very quick break. The resulting spark is much better, and the motor can be run at a higher speed.

The friction clutch and transmitting mechanism are shown in the diagrams. The friction clutch and flywheel are mounted together. Inside the flywheel, *V*, is a cone-socket upon which is applied the conical piece, *U*, of aluminium. The two cones are normally pressed together by a spring, *X*, and are separated by the rod, *Q*, which is operated by the pedal, *l*. A double set of ball-bearing collars are used to take up the thrust.

From the friction clutch the main transmission shaft passes first through the speed-changing box, and thence to the differential. This shaft is divided into two parts, one a square portion which carries the sliding set, *A E*, comprising the two gears, and one of the jaws of a clutch (seen between *E* and *D*). The second part, carrying the other jaw of the clutch, passes out of the gear box and through a double-jointed transmission rod to the differential, where it carries a bevel driving gear. The main shaft, made thus in two portions, may be operated as a whole when the clutch is in contact; or, by separating the jaws of the latter, the first part may be made to operate the second at different speeds by using the intermediate gear set below. The lower shaft carries a set of gears, *B G C*, for the two speeds and reverse. The transmission can be made either through *A B C D* for the first speed, *E G C D* for the second, or by direct coupling through the jaw clutch for maximum speed, by sliding the upper gear-set back and forth. The method of throwing the gears into contact is a special feature of the Renault machines. The lower shaft, *B G C*, rotates in a pair of eccentric bearings; it is not shifted to the right or left but can take a to and fro movement so as to approach the upper set. In this way the teeth do not engage in the ordinary way by a side movement, but strike each other face to face over their entire surface. The gears are first thrown opposite each other, then one set is applied to the other progressively, so that the teeth of one mesh with those of the other. In this way there is much less shock than usual in the speed changing, and the meshing of the gears is effected easily. Two movements are therefore necessary to change gears—one the shifting of the set, *A E*, and the second a forward and back movement of *B G C*. This is accomplished in a very simple and effective manner by a single movement of the lever. An upper shaft, *P*, operated from the driver's lever, carries a screw thread, *F*, which works in the collar of the gear-shifting fork, *F*. When the shaft is rotated, the screw moves the fork back and forth to shift the gears. To bring up the lower set, *B G C*, the same shaft carries a cam, *H*, on the right, which operates a rack. The latter engages with the bearing of the lower shaft, which is mounted so as to take a rotary movement. The shaft is mounted eccentrically in this bearing, and when the latter is rotated, the shaft is elevated or depressed, throwing the gears in or out of contact. A similar rack is used on the left side. The relative position of the fork and the cam is such that the two operations succeed each other properly; thus upon turning the shaft, *P*, the speed-changing takes place as follows: First, *B G C* is lowered; next the set, *A E*, is displaced laterally; then *B G C* is raised, throwing the proper gears into mesh. The reverse is obtained as usual by a supplementary gear, *S*, mounted on a separate shaft and engaging with *A*. Upon shifting to the extreme left, *A* drives *B* through the gear *S*, giving the reverse movement. The transmission is made direct through the clutch for the maximum speed. This system of direct transmission, which is coming into use, is a decided advantage, especially for the racing machines in which the high speed is nearly always engaged, as the use of gearing is dispensed with.

The maneuver of the upper shaft is obtained by a toothed sector, *L*, fixed on the shaft, *K*, at the extremity of which is the speed-changing lever, *J*. The sector engages with a small pinion, *M*, and turns it rapidly. On the same shaft with *M* is carried a bevel gear of larger diameter, which drives a small pinion, *O*, the latter being mounted at the extremity of the shaft, *P*. By this arrangement of double gears, a displacement, even slight, of the main lever, produces a rapid rotation of the shaft, *P*. The lever, in passing from one notch to the other, turns the shaft rapidly enough to allow of the three movements above mentioned. The gears which operate the shaft, *P*, are inclosed in a separate case of special form, mounted close to the speed-changing box, as will be noticed.

The main transmission rod carries a joint at the end of the speed-changing box and a second at the differential, affording a flexible transmission. The position of the joints is calculated so that when the machine is loaded the rod takes a horizontal position. The differential case is of steel, and has fixed to it two steel tubes, through which pass the main axles of the wheels. The side thrust of the axles is taken up by a ball-bearing collar mounted at each side of the differential case; these collars can be regulated from the outside by screw-rings. At the ends of the tubes are mounted the journals of the main axles, which are also provided with thrust bearings.

The Peugeot racing car, which has been quite successful in this year's events, differs considerably from the preceding. One novel feature is the use of a water-cooling device somewhat similar to that employed on the Mercedes cars. It is the first machine of any note in which such a system is used in France. The radiator is mounted in front of the motor, as will be observed; it is made up of a great number of short copper tubes around which the water circulates, its construction giving it a honeycomb appearance. The water is circulated by a centrifugal pump of large output, driven from the flywheel by friction, and sending the water from the motor to the radiator, where it is quickly cooled. In the rear of the radiator is a ventilating fan driven by the motor. This fan draws a current of air through it independently of the speed of the car. The cooling being thus aided by the fan, a much smaller quantity of water can be used, and in fact the 4 gallons which are contained in the water-jackets and piping system, are sufficient for the cooling without the use of a separate reservoir. In this way a considerable gain in weight is secured. The exhaust pipe has been made especially large, with a good-sized muffler quite near the motor, designed to reduce the back pressure to a minimum.

The friction clutch is similar to that used in the Renault car. Chain transmission is employed to drive the rear wheels. The speed-changing mechanism and differential are mounted together in a large, flat, aluminium box, leaving only the ends of the axles for the driving sprockets projecting on each side. The speed-changing device gives three speeds and a reverse. It is operated by a single lever placed at the side of the driver's seat. The movement is transmitted to a vertical shaft, which operates a fork used to shift the gears. These are of the ordinary sliding type, but are arranged, like those of the Renault, to drive direct on the fast speed. On this speed, the motor shaft is direct-connected with the bevel gear that drives the differential of the countershaft, so that the only loss in transmitting power is in the one set of bevel gears and the sprocket-and-chain drive employed from the countershaft to the rear wheels. The reverse is obtained by an intermediate pinion.

The Decauville light-weight car is another of the leading types. It is here shown with a four-seated carriage body; when used as a racer the rear seats are removed. The motor, *M*, mounted behind the radiator, has two cylinders of 4.4-inch diameter and the same stroke, giving 10 horse power at a speed of 1,000 revolutions per minute. A characteristic feature is the mounting together of the motor and speed-changing box, so as to form a solid piece. This secures a rigid transmission, which is independent of the movements of the frame, and avoids jamming of the bearings. The friction clutch is mounted between the motor and the speed-changing box. The latter has three speeds and a reverse, and is similar in principle to the others. Many of the new machines are adopting the method of direct connection between the motor and differential at full speed, also the double-jointed rod transmission. Here, however, the rod is short, and passes obliquely to the differential. A novel feature of the Decauville machine is the use of the small dynamo, which keeps the ignition accumulators always charged by means of a set of automatic switches. In this way the mishaps due to the exhaustion of the battery are avoided. The radiator is fed by a centrifugal pump, driven by the motor.

A light-weight car which has been especially prominent this year is the Darracq. When built as a high-speed racing car, as shown in the photograph, it has a 4-cylinder motor giving 20 horse power. The views of the frame show the same machine with a 2-cylinder motor of 12 horse power, which runs at 1,200 revolutions per minute. The arrangement of the mechanism resembles closely that of the preceding type. Behind the motor is the friction clutch, then comes a speed-changing box which has also the interlocking system for full speed. The shaft turns in ball-bearings. The differential carries at each end a steel tube which incloses the rear axles. Ball-bearings are used to take up the thrust of the axles. A jointed-rod transmission is also used from the speed-changing box to the differential.

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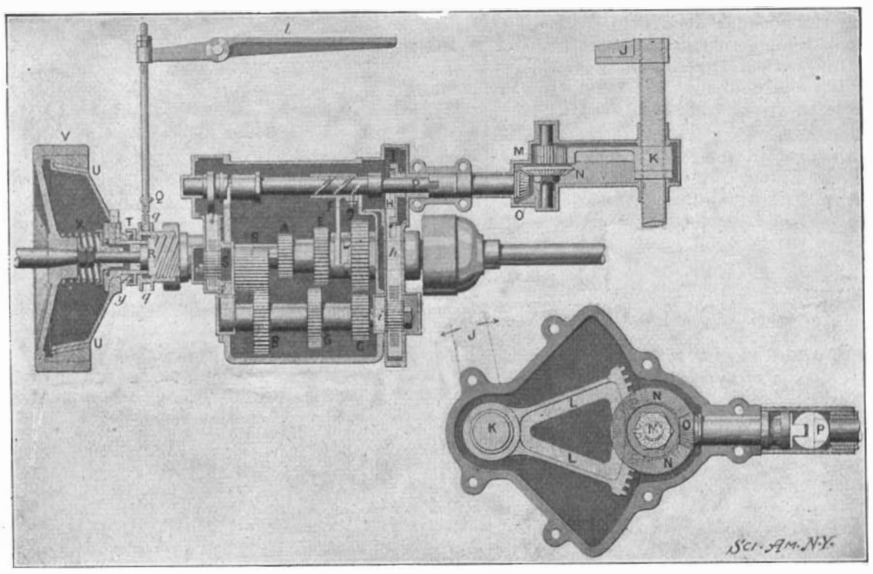
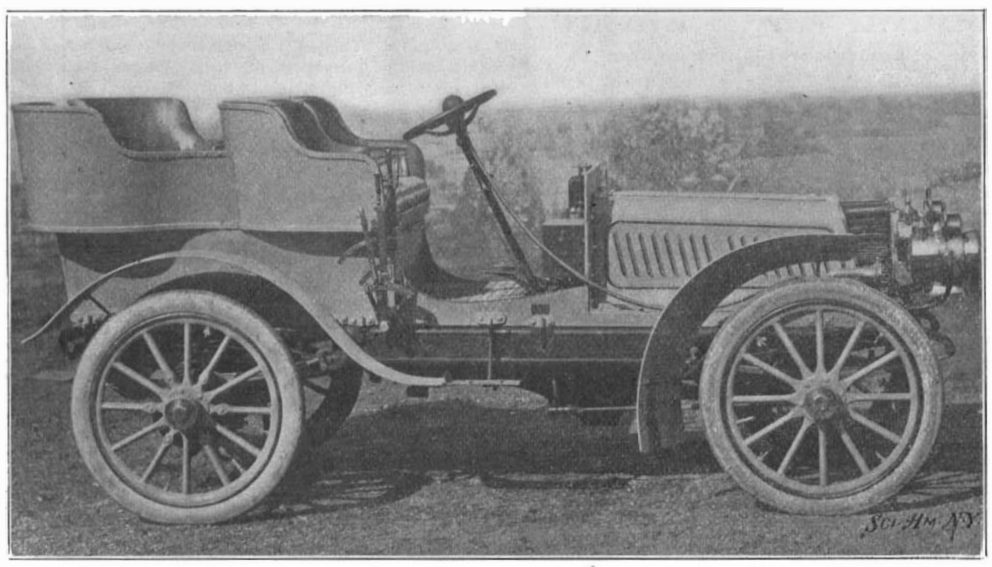
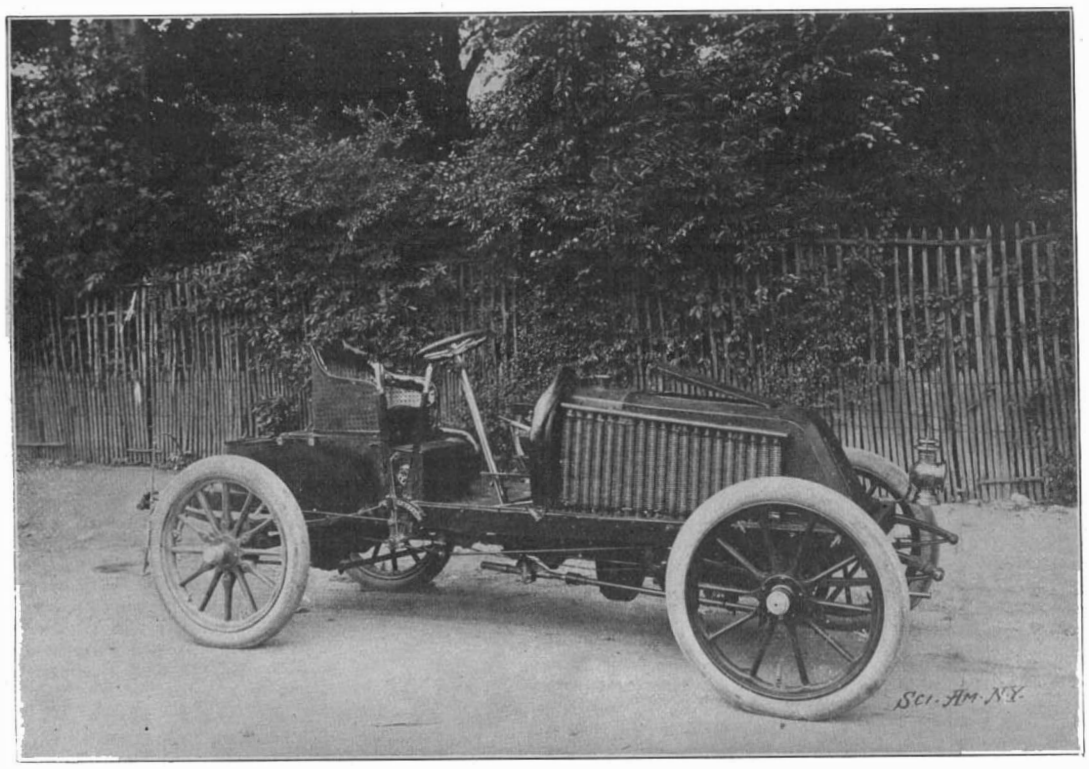


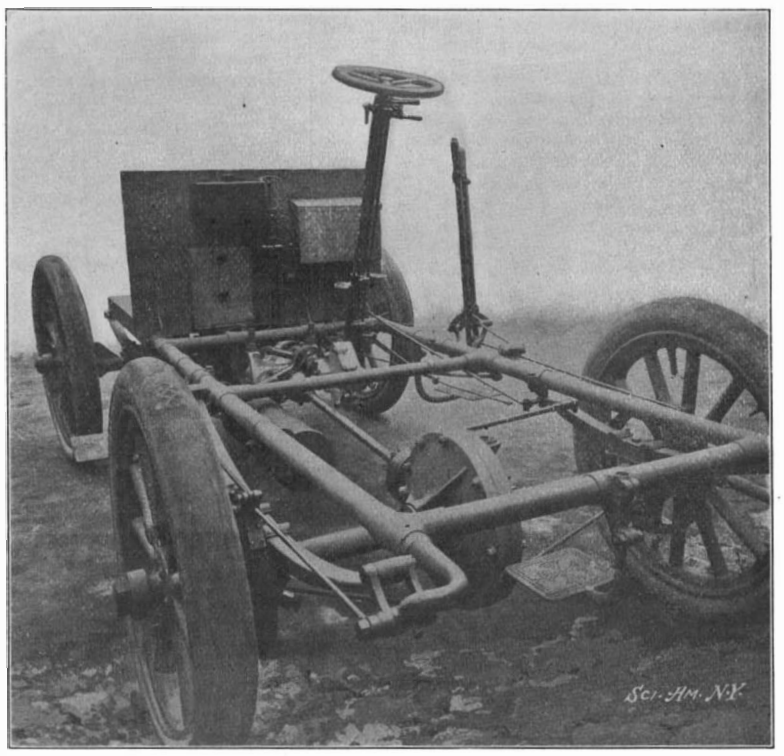
Renault Speed-Changing Gear.



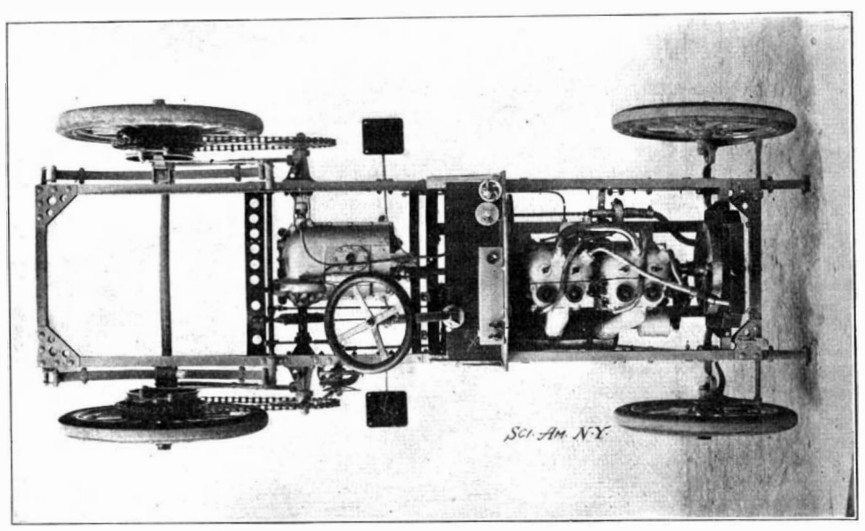
Decauville Light-Weight Touring Car.



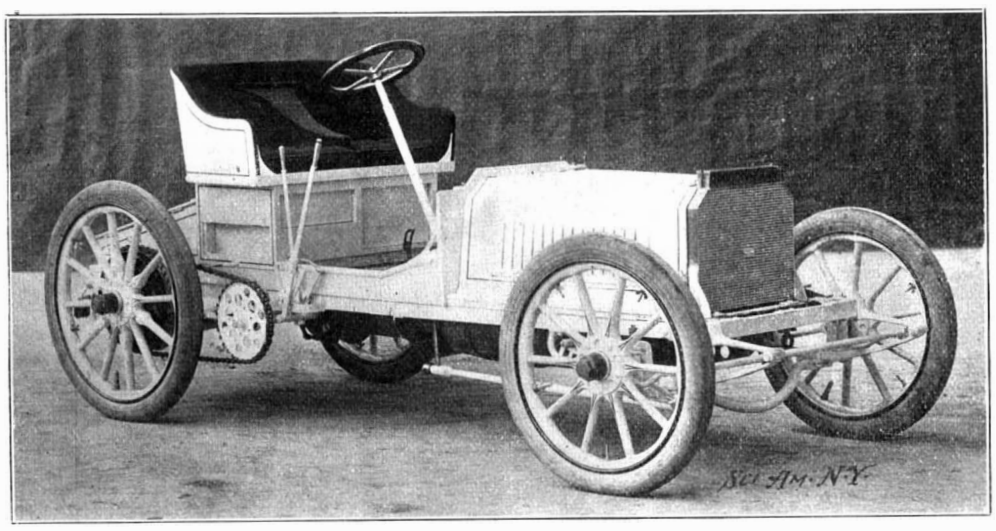
The Car in Which Renault Won the Paris Vienna Race.



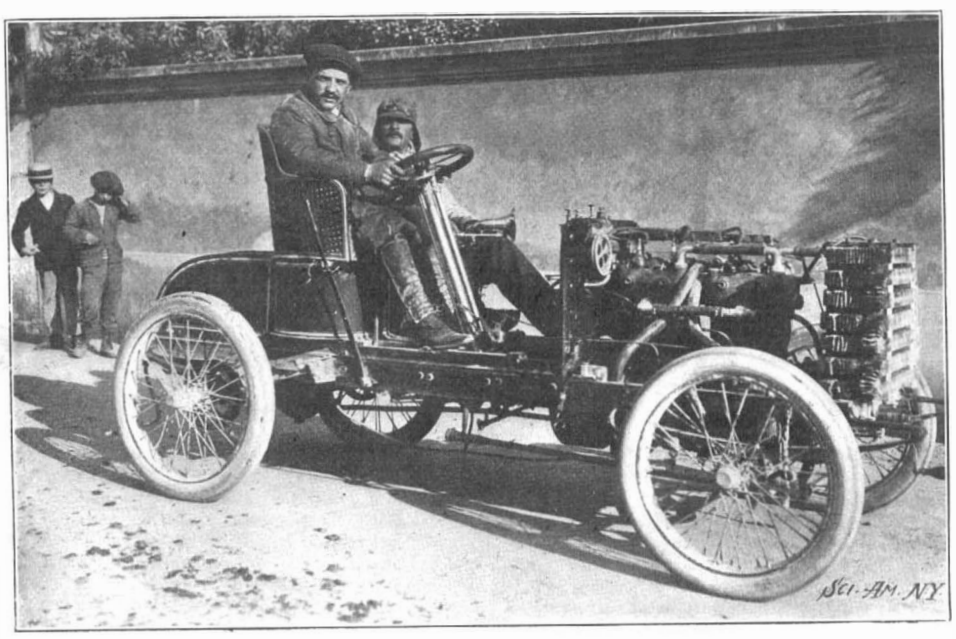
Renault Light-Weight Car With Body Removed.



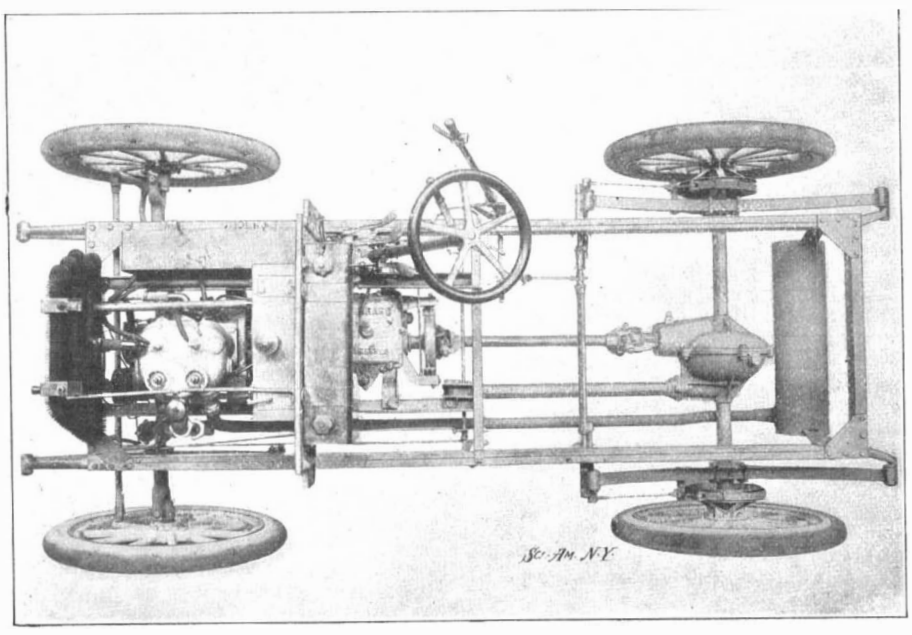
Chassis of the Peugeot Car.



Latest Peugeot Model.



A Darracq Racer.



Chassis of Darracq Car.

LEADING TYPES OF FRENCH LIGHT-WEIGHT AUTOMOBILES.

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements.

SUGAR-CANE-TRASH GATHERER, CUTTER AND SPREADER.—H. B. Gray, Johnstone River, Queensland, Australia. This invention provides an improved device adapted to be moved over the harvest sugar-cane fields to pick up all the sugar-cane trash such as leaves, tops and the like left by the cane-cutters on the field. The machine cuts the picked-up trash into small pieces and spreads the latter evenly over the ground to permit of conveniently plowing the same under.

CULTIVATOR.—J. O. Lawrence, Monticello, Iowa. Mr. Lawrence's invention relates to improvements in cultivators of the disk type. The purpose of the invention is to provide a light, durable, economic and simple device, adapted to hoe and thin out any drilled crop, taking two rows at once, and to follow a planter of the same width.

AGRICULTURAL TOOL.—D. Lubin, New York. The invention relates particularly to improvements in devices for digging and breaking up the ground and the object is to provide a device of this character that may be manually operated to break up and finely pulverize the ground with comparatively little exertion on the part of the operator as compared with spreading in the ordinary manner.

STACKER.—G. W. Worley, Goldfield, Iowa. A mechanism for carrying off the straw and chaff from threshing machines and stacking the same at any desired adjacent point is provided in this invention. An important feature of the machine is the rake which is mounted in a revoluble drum. The rake is thrown outward by centrifugal force, and a guide ring, held relatively stationary and mounted eccentrically to the axis of the drum, controls the outward movement of the rake.

Electrical Devices.

LIGHTNING-ARRESTER.—J. E. Cordovez Panama, Colombia. An improved lightning arrester has been invented by Mr. Cordovez. The device belongs more particularly to that type in which a magnet by attracting an armature produces a ground connection, so as to direct the flow of lightning or of any undesirable charge of electricity to the earth.

HOT-WIRE ELECTRIC METER.—R. S. Stewart, Detroit, Mich. Mr. Stewart's invention relates to a meter for making electrical measurements of various kinds and capable of use as a volt-meter, differential voltmeter, ammeter, etc., according to the materials used in its construction and the proportion of the parts. It is also capable of use with both alternating and direct currents.

RECTIFIER FOR SINGLE OR POLYPHASE ALTERNATING CURRENTS.—A. Nodon, 97 Rue St. Lazare, Paris, France. This rectifier mainly consists of an electrolyte formed of a saturated solution of bibasic phosphate of ammonia employed either by itself or in the presence of a phosphate of any one of the following metals or oxides: alumina, iron, copper, lime, or magnesia, in which solution are dipped two electrodes, one of which is made of an alloy of aluminium and zinc in the proportion of 95 per cent of aluminium and 5 per cent of zinc, while the other electrode is constructed of iron, steel, or cast-iron, or of a combination of iron with carbon, silicon, tungsten, molybdenum and tantalum.

Engineering Improvements.

PUMPING-ENGINE.—F. L. Orr, Thurman, Iowa. Improvements are provided by this invention in that type of liquid elevating means operating under an explosive and a vacuum energy created by the combustion of the explosive mixture, and in which, after being started, the operation will continue so long as the working agent is fed thereto. The present invention primarily seeks to provide a pump of the character stated which will have a simple, effective and economical construction, and in which the operation can be conveniently controlled.

ROTARY STEAM-MOTOR.—H. Roeske, Philadelphia, Pa. This motor belongs to that class of rotary engines known as "impact engines" in which jets or sheets of steam escaping from one surface are allowed to impinge upon another surface to produce either direct or reactionary rotary movement in one of the two surfaces. In the present invention the steam issues from a rotary moving surfaces and impinges upon a stationary one to impart a reactionary rotary movement to the surface carrying the steam passageways. A number of important details of construction are comprised in this invention.

RAM.—C. C. Wentworth, Roanoke, Va. The ram comprises an automatic air supply for the air dome, consisting of a standpipe having its lower end in open communication with the drive pipe and its upper end opening into the air dome, the standpipe having an inwardly opening air valve intermediate its length. A nozzle above the air valve prevents too rapid flow of the air which will not have time to get away before another stroke. Therefore the action of the water in a vertical pipe and the action of the valve just below the nozzles will not be impeded by the inertia of the water above it, having only to further compress this small amount of air which finally reaches a tension that insures its passage to the air chamber.

HYDRAULIC RAM.—J. A. Snavely, Crockett Depot, Va. One of the objects of this invention is the provision of valve means for controlling the intermittent flow of the current under pressure so as to vary the number of pulsations per minute, and to secure a decrease or increase in the capacity of the apparatus. Means are provided for deadening the sound and limiting the play of the waste valve. A novel form of check valve is also employed which is adapted to quickly seat itself after each pulsation and to serve as a buffer to minimize wear.

Hardware.

SOLDERING-IRON.—C. A. Kaiser, Long Island City, N. Y. Mr. Kaiser's invention relates to soldering irons adapted to have gas burned therein whereby to heat the iron. The instrument comprises a body or head part and a removable lid, the lid having an igniting orifice, the covering being mounted on the lid to swing toward and from the orifice therein, and a cover for this orifice.

CLIPPER.—R. F. Werk, New Orleans, La. Mr. Werk is the inventor of an improved clipper for cutting the outside fibers from cordage of any sort. The instrument is of peculiar construction involving two knives or sets of knives which are relatively movable in concentric circles, the cord being passed through the center of such circles.

Mechanical Devices.

POWER DEVICE.—D. Lubin, New York, N. Y. The object of the present invention is to provide a manually-operated power mechanism of simple construction that will be found of great utility and adapted for a variety of uses on a farm, such as drawing vehicles loaded with various products to a central or delivery station, and for drawing or propelling tillage implements.

VARIABLE-SPEED AND REVERSING GEAR FOR MOTOR-CARS, TOOLS, OR OTHER APPARATUS.—J. E. Mennessier, 59 Rue de la Roquette, Paris, France. This system of variable speed and reversing gear is chiefly characterized by the arrangement upon a driving shaft of an eccentric which is capable of being shifted longitudinally of said shaft for the purpose of gradually varying the speed, which transmits through the medium of a rocking lever and pawl-carrying arms a movement of rotation to two ratchet wheels which are thrown into gear alternatively, by means of a clutch, with a driven shaft, whereby a continuous rotary motion is imparted.

ICE-MAKING MACHINE.—R. F. Learned, Natchez, Miss. This invention relates more particularly to improvements in the freezing can of ice-making machines, the can being intended to receive from below a supply of compressed air or gas, a portion or all of which is allowed to pass through the body of water and result in a clear transparent block of ice. In the present invention the can is provided with a sub-chamber adapted to receive the charge of air or gas. An improved valve mechanism is employed adapted to close from liquid pressure from above and below in order to exclude brine from entering the can, the valve mechanism opening freely to air or gas pressure from below.

APPARATUS FOR DISTILLING LIQUORS.—J. C. Bertsch, Atlanta, Ga. Distilled water contains a certain quantity of air and if this water be used for making ice, the cakes of ice will have air bubbles therein. To produce absolutely clear ice it is necessary to eradicate the air bubbles from the water by "reboiling" the water. The present invention provides an economical system for this purpose, whereby the water of condensation is led to the reboiling apparatus at the highest possible temperature.

FEED-ROLL.—G. A. Ensign, Defiance, Ohio. The present invention provides improvements in that class of feed-in rolls for wood planing or other surfacing machines, in which a series of individual rollers are so mounted upon a rotary shaft by means of intermediate, non-rotatable hubs and so acted upon by springs as to allow them to yield to accommodate strips or pieces of lumber which are of different thicknesses without unduly straining the roll-supporting shaft.

BRAKE MECHANISM.—R. B. Hain, Los Angeles, Cal. This improved brake mechanism is especially adapted for use in connection with transmission gear devices in which a plurality of brake drums are included, and it is especially adapted for use in connection with peculiar forms of transmission gear devices, which are covered by another patent of Mr. Hain's.

APPARATUS FOR THE PRODUCTION OF FLAT HELICES, HELICAL SPRINGS, FLEXIBLE HELICAL SHAFTS, OR THE LIKE.—G. Trouvé, Paris France. The present invention relates to improved apparatus by means of which flat helical springs, and helical shafts of any kind wound edgewise can be produced from strips of metal in a very simple manner. The apparatus comprises a revoluble mandrel on which the helices are formed between two revoluble cones which may be adjusted toward and from each other.

KNITTING-MACHINE.—G. W. Ruth, Norristown, Pa. The invention relates to a circular-rib-knitting machine and the improvements lie in certain novel devices for controlling and actuating the cams of the cylinder and dial needles A pattern wheel is employed and the machine also comprises a pawl carried thereon for actuating the pattern wheel, a device for periodically throwing the pawl out of action and a plunger serving to periodically throw the pawl back into action.

FRICTIONAL GEARING.—E. Rawson, Moscow, Idaho. An improved frictional gearing is herein provided which is designed for use on sawmills, planers, etc. The construction is simple and durable, very effective in operation and arranged to enable the operator to quickly and conveniently adjust the gearing to any desired speed, or to reverse the same according to the nature of the work in hand.

PLANER.—E. Rawson, Moscow, Idaho. An improved planer which is of simple and durable construction, and very effective in operation, has been invented by Mr. Rawson. The machine is more especially designed for reducing timber to any desired thickness and width, and it is arranged to permit the operator to shift the side cutter-heads independent one of the other while the machine is running.

CLUTCH.—M. Langman, New York, N. Y. This novel form of clutch will transmit rotary movement from one part to another in one direction, but permits free rotation of parts in the other direction. The clutch is of simple and durable construction, and is applicable to all sorts of machinery, as, for example, the cloth cutting machine described below.

CLOTH-CUTTING MACHINE.—M. Langman, New York, N. Y. The present invention relates to a cloth-cutting machine in which the blade has a combined reciprocal and edgewise movement, the blade having a wide cutting end edge, and a cutting side edge. The advantage of this construction is that as the knife descends longitudinally, its wide end performs a downward cut and then, as the knife ascends, it moves outward in the direction of its side edge and performs a further cut.

SELF-PLAYING MUSCIAL INSTRUMENT.—J. Kruft, Jersey City, N. J. This musical instrument is of the guitar-zither type and is provided with hammers to strike the strings with a recoil action so as to insure softness and sweetness of tone. The construction permits convenient removal of the guitar-zither to permit of playing it by hand whenever it is desired to do so.

Railway Improvements.

SAFETY-GUARD FOR RAILROADS.—W. Morsehead, Yale, Mich. Means are provided in the present invention for the prevention of accidents at railroad crossings and other points along the railroad track caused by the retention of the foot of a person which may be inadvertently introduced between a track rail and an adjacent edge of planking that covers such a crossing.

CAR-FENDER.—W. B. Collins, North Dartmouth, Mass. This improved car fender is normally in a position a distance above the track to readily clear switches and the like. The fender may be moved suddenly into an active position in case of an emergency at the will of the motorman or other car attendant to cause the fender to safely pick up any obstacle that may be in the path of the car.

TROLLEY-POLE HARP.—J. H. Walker, Lexington, Ky. The construction of this trolley-pole harp is such that it will not shear off span-wires when the wheel leaves the wire. Also it will not hang up in any angle of wires and will not pull down on top of low wires, nor allow wedging of the wires between the wheels and the prongs of the harp.

CONTACT FOR TROLLEY-HARPS.—J. H. Walker, Lexington, Ky. The present invention provides positive and decided contact points for a trolley-harp which will constitute a journal for the pin or axle supporting the trolley-wheel. The construction of the contact points is such that the rotary motion of the trolley wheel will be impeded but very little, as the improved contact points are more free from friction than the ring or brush contact usually employed.

TROLLEY-CATCHER.—E. M. Zwing, Philadelphia, Pa. The present invention aims to provide means for automatically preventing a trolley pole from flying upward to a vertical position when the trolley roller or shoe jumps off an overhead conductor, thus preventing the pole from assuming a position sufficiently high to injure the parts or break the overhead stays.

RAIL-JOINT.—C. O. H. Miller, Williamsport, Pa. An improved rail-joint is provided in the present invention which is of such a character as to lessen, if not entirely obviate, all jarring of passengers caused by hammering of the car wheels as they roll from rail to rail across the spaced ends thereof with joints as heretofore commonly formed.

Miscellaneous Inventions.

MEANS FOR SEALING PRESERVING-JARS.—W. Walter, Shelton, Wash. Preserving jars may be effectually sealed by means of the present invention in a way to overcome the presence of a vacuum at the top of the fruit or other commodity packed in the jar. Also the accumulation of air will be prevented, thus obviating the formation of mold on the fruit.

HOLDER FOR PENS, PENCILS, OR THE LIKE.—C. F. Walter, New York, N. Y. An improved holder for pens and pencils is provided in this invention. The device may be conveniently fastened to a vest or other garment, or to the inside of a pocket to allow the wearer of the garment to readily insert and securely hold the pen or pencil and conveniently remove the article whenever it is desired to do so.

TRICK-SWORD.—W. Thomas, Palatka, Fla. This invention provides a device for creating the deception of a sword thrust through a living person. The trick sword comprises two blade sections and curved arms connected respectively with these sections, the curved arms being adapted to pass around one side of the body of the user. In connection with the trick sword is a flexible tube and a bulb which may be operated to force out a liquid on to the sword to represent blood.

SUPPORT FOR VESSELS.—A. P. Hallock, Yonkers, N. Y. An improved device is hereby provided for supporting demijohns and other vessels in such a manner that the vessel is securely held in position against accidental displacement on a stand, and when it is desired to pour out the contents of the vessel, the vessel can be readily tilted without requiring much physical exertion on the part of the operator.

GLAZIER'S POINT.—T. N. Parker, New York, N. Y. Mr. Parker's invention relates to a fastening used by glaziers for securing window-panes in the sashes of windows. The shape of the fastening is such as to adapt it to a great variety of uses. The fastenings can be placed around overlapping edges of panes of glass, so that the lap will hardly be noticed and the joint thus formed is a perfect union and is practically airtight.

COMPOSITION OF MATTER.—J. Poliakoff, Moscow, Russia. This invention relates to a composition of matter designed particularly for use in construction of molded articles such as ornaments, vases and the like. It consists in reducing glue to liquid form under heat, adding plaster mixed with water and bringing the material to boiling point, then adding glycerine and wax and finally adding chrome alum. This composition will be found practically unbreakable and waterproof.

CULINARY APPLIANCE.—S. Worley and W. A. Sullenbarger, Belle Plaine, Iowa. The appliance which is provided by this invention may be conveniently used in any oven for roasting meat. It permits the meat to be easily placed in or removed from the device, allows the roast to be conveniently turned from time to time, and provides for holding the roast at any desired point of adjustment in order that the meat may be browned at any particular part.

HAIR-PIN.—T. C. Allen, Sydney, N. S. W., Australia. The invention provides a pin which, when inserted in the hair, will firmly retain its position until it is desired to remove it; the hair also will be securely and firmly retained in the desired position, and thus is obviated the inconvenience and annoyance so often caused by falling out of pins now used for the purpose.

HEAD FOR OIL-WELLS.—F. J. Moser, Kane, Pa. Means are provided in this invention for packing the tubing of an oil-well in the casing-head so as to prevent leakage of the gas. The head which is screwed on the top of the casing is provided with horizontal nipples for the gas tubes and a stuffing box for the vertical tube. Means are provided for adjusting of this tube without permitting escape of the gas.

GLASS-CUTTER'S BOARD.—A. T. Whitehouse, Lisbon, No. Dak. This invention provides a simple means for holding the straight edge on the glass to be cut, also permitting the straight edge to be moved to any desired part of the board and to any desired angle, and to swing upward from the board when it is desired to place glass thereon or remove the same.

SHELVING.—J. M. Lippincott, Oakland, Ill. The improvement belongs to that class of shelving in which a shelf-section is movable vertically to a height above the ordinary fixed shelving and then adjusted back over said shelving. In the present invention the object is to simplify a construction provided by a former patent, thus rendering the apparatus easier to operate, and to improve its general appearance.

APPARATUS FOR LAUNCHING LIFE-BOATS FROM SHIPS.—C. F. Petersen, Wilmington, Del. By the use of this mechanism boats may be launched from either side of the vessel with the least possible manipulation of tackle. The boat is run off the gunwale and dropped in a position ready to leave the ship or dock in a direction at right angles to the side of the ship or dock to permit free use of the oars on both sides of the boat.

SUBSTITUTE FOR WHALEBONE STIFFENING-STRIPS.—A. M. Weber, New York, N. Y. The material is made up principally of vegetable fiber known as "plassava" or "bast," and obtained from the *Attalea funifera*, a palm whose leaf stock is stiff and wiry, yet flexible. These fibers are long, hair-like threads possessing great strength and resiliency, and are of a whitish color. The fibers are bound together and held by means of a covering woven upon them.

Note.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**
MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

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For hoisting engines. J. S. Mundy, Newark, N. J.

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"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 3569.—For party to build portable house 60 to 70 feet in diameter.

Coin-operated machines. Willard, 284 Clarkson St., Brooklyn.

Inquiry No. 3570.—For makers of goods for the mail order trade.

Dies, stampings, specialties. L. B. Baker Mfg. Co., Racine, Wis.

Inquiry No. 3571.—For the manufacturers of the cylinder known as the "Kriebel" engine.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 3572.—For four patents of merit on light machinery, tools or iron novelties, on royalty basis.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 3573.—For index shears and knives for indexing dictionaries with the Thumb Index.

Write for anything you want made in metal novelties to Metal Stamping Co., Niagara Falls, N. Y.

Inquiry No. 3574.—For makers of cathedral gongs for clocks.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 3575.—For a shoemaker's awl sewing with a lock stitch, etc.

Saw hammering taught by mail. No advanced fee. Over 1,000 satisfied customers. Miner, Lumberton, Miss.

Inquiry No. 3576.—For makers of porous brick, to be saturated with oil for cooking and heating purposes.

Automobiles built to drawings and special work done promptly. The Garvin Machine Co., 149 Varick, cor. Spring Streets, New York.

Inquiry No. 3577.—For dealers in levigated oxide of tin.

WANTED.—Machinist used to light machinery, sewing machines and repairs. References. "Newark," Box 773, New York.

Inquiry No. 3578.—For manufacturers of gas balloons.

Manufacturers of patent articles, dies, stamping tools, light machinery. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 3579.—For the address of the German Thermite Co.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 3580.—For manufacturers of peat machines.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 3581.—For makers of papier maché portable houses.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $5. Munn & Co., publishers, 361 Broadway, N. Y.

Inquiry No. 3582.—For manufacturers of wire racks or baskets.

PATENT FOR SALE.—"Trolley Mail Box Carrier" carries the mail box from the line of the R. F. D. to the residence and returns it to line of delivery. Something new and a good seller. Will sell for cash or on royalty.
A. L. Mumma,
Mechanicsburg, O.

Inquiry No. 3583.—For tin and nickel plated nozzle sprays similar to those used in bathtubs.

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Inquiry No. 3585.—For machines for knitting hose and underwear.

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Inquiry No. 3587.—For a pneumatic or other machine for pulling wax.

Inquiry No. 3588.—For makers of the Gravity coal oil burner.

Inquiry No. 3589.—For manufacturer of novelties.

Inquiry No. 3590.—For makers of a machine for printing several copies of typewritten work by a photographic process.

Inquiry No. 3591.—For manufacturers of adding and listing machines.

Inquiry No. 3592.—Wanted, parties to manufacture a small cast and wrought iron machine in large quantities.

Inquiry No. 3593.—For makers of iron or steel water wheel.

Inquiry No. 3594.—For practical men to suggest how to lay off dam and canal for county mill.

Inquiry No. 3595.—For machinery for making pearl buttons.

Inquiry No. 3596.—For machines for manufacturing articles from the hull of the cocoanut.

Inquiry No. 3597.—For makers of polishing preparations for metals.

Inquiry No. 3598.—For makers of practical dishwashing machines

Inquiry No. 3599.—For dealers in electro-plating apparatus in Chicago or St. Louis,

Inquiry No. 3600.—For coiled iron pipe of special dimensions.

Inquiry No. 3601.—For parties dealing in parts of horizontal engines.

Notes and Queries.

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Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled

(8774) W. H. H. wants a receipt to obtain a red cherry color on pure copper, done by immersion in hot acid, not by battery or dynamo. What I want is not enameled, but colored, same as Tiffany or Whiting do large loving cups. Either cherry or mahogany color. A. A color of this kind in copper can be obtained by slowly heating in an air bath, with gradually rising temperature. Long heating at a comparatively low temperature or more rapid heating at a higher temperature will give the same effect. As soon as the desired color is obtained, cool rapidly by plunging into cold water. If lacquered after finishing, it will keep better.

(8775) F. M. H. asks: How many cubic feet of free air will it take to fill an air tank having a capacity of 100 cubic feet at a pressure of 200 pounds per square inch? And how long a time will this amount of compressed air run an engine doing actual work of 5 horse power? How many cubic feet of free air will it take to raise 5,000 gallons of water 50 feet being compressed; state what pressure, using the direct air lift system? A. It will require 1,400 cubic feet of free air to fill the tank of 100 cubic feet capacity at 200 pounds pressure. This amount of air will run a 5 horse power engine 2 1-3 hours. The amount of free air at an average of 100 pounds pressure for pumping 5,000 gallons of water 50 feet high may be from 600 to 800 cubic feet, depending upon the efficiency of the pumping system.

(8776) G. O. W. asks: 1. Please inform me how many ounces one cubic foot of hydrogen gas will lift. A. A cubic foot of hydrogen at 30 inches of the barometer, and at the freezing point, weighs 0.00562 pound. A cubic foot of air under the same conditions weighs 0.08071 pound. A cubic foot of hydrogen will balance in the air under normal conditions, as above, the difference of these two weights, and will lift a weight slightly less than this difference, or about 0.07 pound. This is the basis of the usual statement that 1,000 cubic feet of hydrogen will lift 70 pounds. It will do so when the barometer stands at 30 inches and the temperature is at freezing. 2. How to deposit platinum black on string or wire. A. To deposit platinum black on a string is not easy. We cannot suggest any better way than to mix the finely divided platinum with a gum or mucilage and coat the string with that mixture. For wine dip or cover with platinic chloride and heat in a Bunsen burner till the platinum is reduced to a black powder. The ammonium platinum chloride can be reduced better than the simple chloride.

(8777) T. E. M. asks: What is the freezing pressure of water? About what pressure does freezing exert on fence posts set in wet ground? A. The pressure exerted by water in the act of freezing is enormous; how great we have no means of knowing. Heavy steel tubes have been filled with water and screwed up. So, too, have bombshells. When the expansion of the water burst the shell, the water flashed into ice in the instant when the pressure was relieved. It is believed that water under great pressure will not freeze. This is because water has its freezing point lowered by pressure. A pressure of 15 pounds to the square inch lowers the freezing point 0.0175 deg. Fahr., and for other pressures in the same proportion. We doubt if the freezing of the wet earth around a post greatly increases the pressure upon the post, because the pressure is relieved by the rising of the earth around the post. This is easily observed, as also around stones. The reason why posts are more strongly fixed in the frozen earth is that the whole mass, earth and post, becomes one solid mass, and cannot be raised without breaking the mass open as a piece of ice or stone is broken.

(8778) W. F. G. says: I want to make a liquid blacking to apply with sponge lightly, and then with a few rubs with small cotton cloth produce a brilliant polish. A. Mix three pounds of fine lampblack with 1 quart of stale beer and ½ pint of sweet oil; then add 1 ounce molasses, ¼ ounce copperas, and ¼ ounce logwood extract. Copperas can be purchased from any dealer in chemicals and most druggists, and is worth only a few cents a pound. Logwood extract can be bought from dealers in dyestuffs or can be made by boiling logwood chips with water.

(8779) W. S. C. asks: 1. If the electric current enters a building from the street, is it proper to place switch first, or fuse block first? A. The rules of the Fire Underwriters require knife switches to be placed so that when open they cannot drop together, that is, they must not turn up when opened. There is no regulation given as to the position of the fuses with relation to the switch. They must be placed as near the point where the current enters the building as possible. 2. Please describe the mechanism and operation of the American Clock Company's clock of Chicago. A. We have no description at hand of the American Clock Company's clock. 3. Where and how is sal-ammoniac produced? A. The chief source of sal-ammoniac is the "ammonia water" of gas works. This is the water through which the gas is passed to remove the ammonia. By adding hydrochloric acid to this liquid, ammonium chloride is formed. 4. In wiring for electric bells, why is it proper to connect the carbon side of battery to the push button instead of to the bell? A. It seems to be a practice to connect the battery in a certain order to a circuit rather than that it is proper to do it in either way. The bell will operate as well either way. 5. In making a galvanic battery ground connection, why is it proper to connect the zinc pole to the ground? A. There is no reason to say it is proper to connect the zinc pole to the ground in grounding a battery. If, as in the telegraph, the battery is divided, one-half at one end and the other half at the other end of the line, the zinc must be grounded at one end and the carbon at the other end of the line. 6. About how many carbon cylinder battery cells are required for cautery work, such as done by doctors and dentists? A. The number of cells needed in cautery will depend upon the size of wire used, probably five or more. 7. How many ampere hours will an ordinary battery cell give? A. The number of ampere hours a cell will give depends upon its size. Dry cells and sal-ammoniac cells can hardly be said to have any ampere hours, since they cannot be used on closed circuits. Edison-Lalande cells have from 15 to 600 ampere hours according to type. 8. How much of an ampere is required for a 10-volt lamp? A. An incandescent lamp uses from two and one-half to four watts per candle. A 10 c. p. lamp will consume from 25 to 40 watts. 9. About how many years do carbon cylinder battery cells last when used for dwelling house purposes? A. The sal-ammoniac solution must be renewed in a carbon cylinder battery when the cell tests a volt or a little above one volt. The zincs will go till nearly worn through, and the carbons will not need renewing. Use a voltmeter for this purpose. 10. About how many watts are used to charge an electric auto when new? A. A storage battery is charged at 2½ volts per cell, and at a maximum of 6½ amperes per square foot of positive surface, reckoning both sides of the positive plates. 11. About what voltage does a spark coil give that is attached to an automatic gas-lighting burner? A. A spark of good volume, a thick spark of ⅛ inch, will ignite gas, but a coil giving a half-inch spark is commonly used. Several thousand volts are required to force a spark through a half-inch of dry air. 12 Are series or shunt-wound motors used on automobiles? A. Either series or shunt motors may be used on automobiles. 13. About how many miles will an electric auto run after being fully charged, and about how long does it take to charge them? A. It is stated that automobiles have run 100 miles or more on a charge, but about 20 is a fair run. 14. I noticed on the name plate of some generators is stamped five volts drop. What does this mean? A. Five volts drop on a machine means that that voltage is used in the machine itself and must be provided for. 15. Does the Atlantic cable consist of a positive and negative wire, or is the ground used for the return current? A. An Atlantic cable has a bundle of wire in the center for a conductor. There is no return wire. 16. Is the zinc that is used in battery cells pure zinc, or is the zinc alloyed, and what alloy is used? A. Open-circuit cells do not usually have the zincs amalgamated, though this may be done with advantage. Daniell's, Leclanche and gravity cells are used with unamalgamated zincs. Other cells have their zincs amalgamated. This is done by cleaning the zinc in acid and coating it with mercury.

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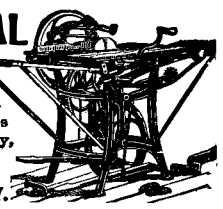

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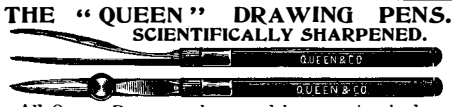

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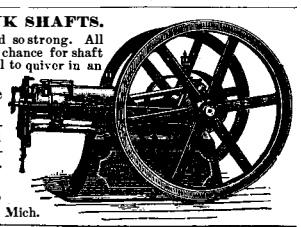

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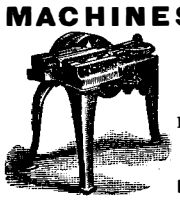

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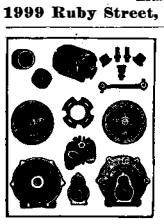

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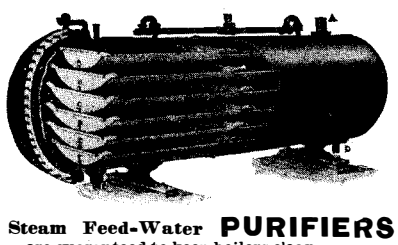

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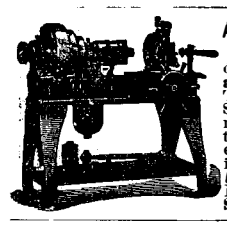

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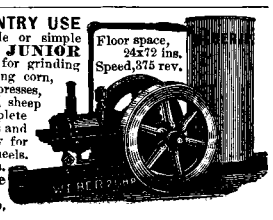

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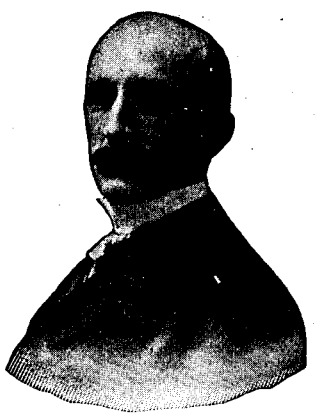
Gage shears, F. H. Farnham 716,015
Game board, H. L. Haskell 715,794, 715,796
Game piece, H. L. Haskell 715,795
Game, toy and advertising device, O. O. Stageberg 715,893
Garment holder, J. D. O'Brien, reissue.... 12,063
Garment supporter, I. Davis 716,198
Gas burner, A. Beler 716,176
Gas burner, acetylene, S. P. Watt..... 716,153
Gases, concentrating, H. A. Frasch..... 715,778
Gas cut off, automatic, A. M. Shough..... 716,119
Gas furnace, E. P. Reichhelm..... 716,277
Gear, transforming, W. H. Brewster..... 716,180
Gearing, antifriction, J. B. Butler..... 715,973
Glass tiles and sheets, manufacture of, W. T. Nicholls 716,086
Golf ball, E. Kempshall 716,245
Golf ball, E. Schultz 716,290, 716,291
Golf ball pocket, R. T. Crane 715,759
Governor, H. J. Bouvier 715,961
Governor, speed, H. H. Nightingale..... 715,845
Grain dump and elevator, combined, A. W. Koon 715,818
Grate, endless chain, W. J. Taylor..... 715,899
Gun, automatic, A. Burgess 715,971
Gun, discharge actuated breech loading, S. N. McClean 715,839
Gun sighting apparatus, Schneider & Canet 716,114
Hammer, power, H. Feldhus 716,019
Handle socket, adjustable, T. Morrin..... 716,077
Harness box and buckle device, J. M. Lebens 716,253
Harvester and shocker, corn, L. L. Freeman 716,023
Harvester, corn, Widerman & Wright..... 716,327
Harvesting implement, B. R. Huske..... 716,045
Hat block, pneumatic, Lamont & Weatherhead 716,251
Hay or fodder fork, F. Dailey..... 715,761
Head gate, H. W. Elder 716,012
Head rest, W. H. Elliott 716,209
Heel rand skiving machine, J. H. Underwood 715,907
Hinge, gate, Rickel & Potter 715,869
Hobby horse, J. W. Smith 715,887
Hoisting apparatus, W. A. Bock..... 715,747
Hoisting bucket, O. & J. Johnson..... 716,239
Hoisting engine safety apparatus, Karlik & Witte 716,243
Hook. See Clothes hook.
Hoop coiling machine, A. F. Ward..... 716,317
Horse overshoe, J. B. McClintock..... 716,266
Hose clamp, F. T. Lippincott..... 716,072
Hot air machine, A. Heil 716,036
Hub, vehicle, Morse & Lampman..... 715,835
Hydraulic engine, A. Legg 716,254
Hydrocarbon burner, J. M. & L. P. Beech.. 716,174
Ice plane, H. Bodenstein..... 715,955
Ice planing knife, H. Bodenstein..... 715,956
Illusion apparatus, Booraem & Howard, 715,958, 715,959
Index system, card, I. B. Hendrickson..... 715,799
Index systems, locking device for card, D. E. Hunter 715,807
Inductance coil, F. Dolezalek 716,206
Ink well, W. S. Claypool 715,984
Insecticide distributer for planters, H. Swindler 716,142
Insole, H. & J. R. Campbell 715,754
Insulated rail joint, W. E. Karns 715,813
Insulating metallic surfaces or wires, J. A. Heany 715,798
Insulator, high potential, G. H. Rupley... 715,875
Ionone, making, A. Strebel 715,896
Jail or cage, portable, J. A. Youngblood... 715,927
Key plate for use in the manufacture of tune plates or cylinders, F. Schippers.. 716,287
Key ring, J. L. Sommer 715,892
Ladder and scaffold, combined, M. Bauer.. 715,944
Ladder, folding, Labranche & Thirot..... 716,057
Ladder, step, M. E. Trafton 716,149
Lamp, W. J. Smart 715,885
Lamp, M. S. Hufschmidt 716,043
Lamp, electric arc, J. A. Heany..... 715,797
Lamp, gas or vapor, O. C. Hoffmann..... 715,801
Lamp, incandescent spirit, R. E. Walther.. 716,316
Lamp, interchangeable direct and alternating current arc, M. H. Baker 715,741
Lantern, signal, A. C. Bunne 716,332
Lathe dog, T. C. Thompson 715,900
Lathes, feed mechanism for screw cutting, W. A. Wood 715,921
Laundry gloss, O. M. Nash 715,844
Lawn edge trimmer, W. W. McCallum..... 715,838
Leather, imitation, G. Youngwitz 715,928
Ledger, flat opening loose leaf, G. F. C. Houghton 716,232
Legging, S. W. Alvord 715,935
Lens, C. A. H. Harting 716,035
Level, spirit, L. Desmarais 716,001
Leveling rod, self computing, A. S. Doak... 716,006
Lever press, compound, S. J. Webb 716,319
Life preserver, J. E. Armstrong 715,938
Lifting jack, screw, T. Hampton..... 716,337

(Continued on page 471)

American Success Series



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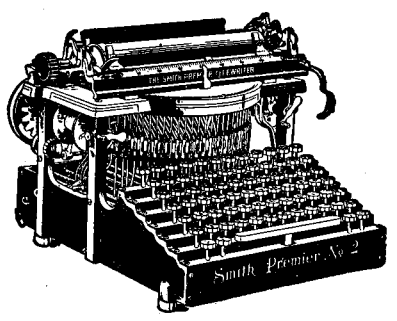

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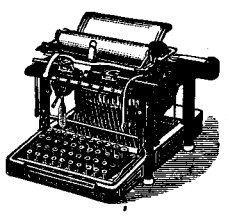

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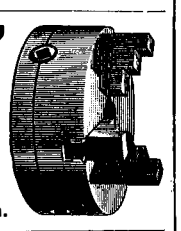

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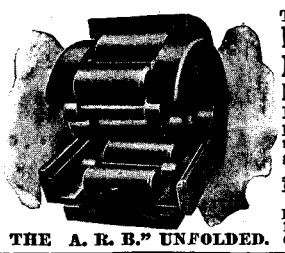

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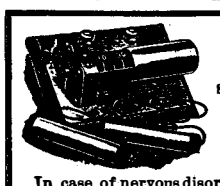

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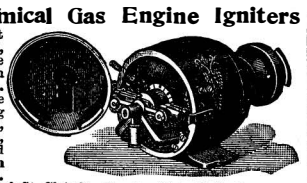

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The Scientific American SPECIAL Transportation Number

With this issue many subscriptions to the **Scientific American** will expire. It is not, therefore, amiss to call attention to the fact that unless subscriptions are renewed before the end of the year, the paper will be discontinued with this issue. In order to avoid any interruption in the sending of the paper, therefore, the subscription for 1903 should be remitted without delay.

It may be of interest to our old subscribers to have placed before them a comparison of four Christmas or special issues which have been published within the last ten days. The following statistics may be of interest:

Harper's Weekly Christmas Number was a 96-page publication, price 50 cents.

Collier's Christmas Number was a 40-page publication, price 25 cents.

Leslie's Christmas Number was a 36-page publication, price 25 cents.

Scientific American Transportation Number was a 52-page publication, price 10 cents.

Had the **Scientific American** been published on a page the size of Harper's Weekly, it would have contained 78 pages instead of 52. From this comparison it may be seen that the publishers of the **Scientific American** endeavor to give their readers the full value of their subscription and a little more.

The various commercial houses which have patronized our advertising columns during the past year may be pleased to note certain statistics with reference to the advertisements contained in these respective issues, inasmuch as the advertising pages of a high-class paper are a pretty fair index of the standing in which the journal is held by the commercial community which has tested its advertising value.

Harper's Weekly contained 11200 lines of advertising.

Collier's Weekly contained 13820 lines of advertising.

Leslie's Weekly contained 11500 lines of advertising.

Scientific American (including the ads on the covers) **contained 18717 lines of advertising.**

This certainly is a very gratifying showing and one of which the publishers of the last-named journal may well feel proud. This large volume of advertising, however, has not resulted in any sacrifice of the reading columns of the paper. As may be seen from the statistics given below:

Harper's Weekly contained 73 pages of reading matter.

Collier's Weekly contained 22 pages of reading matter.

Leslie's Weekly contained 23 pages of reading matter.

Scientific American contained 29 pages of reading matter.

Had the page of the **Scientific American** been printed the same size as that of Harper's Weekly, there would have been 43 pages of reading matter. A weekly journal of this size only becomes possible through the wonderful development of the mechanical art of printing. The typesetting machines and modern presses, together with the development and perfection of high-class colored art work, have made it possible to publish a weekly paper of enormous circulation, and of a size, quality and character at which the publishers of a generation ago would have truly marveled.

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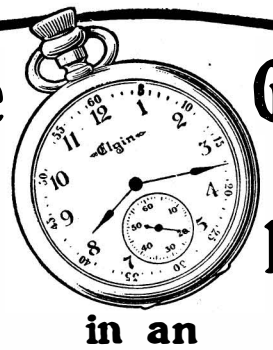
Lithographic purposes, electrolytically preparing metals and alloys for, O. C. Strecker 716,306
Lock, J. O'Connor 716,270
Lock and latch, J. C. Alman 715,934
Locomotive engine, J. E. Roberts 716,107
Locomotive exhaust, F. Robinson 715,873
Log loader, J. R. McGiffert 715,840
Log raft, J. Ayres 715,939
Loom, W. B. Erskine 715,772
Loom for the manufacture of knotted carpets, Panitschek & Ahorn 716,092
Loom, pile fabric, F. Tonnar 716,352
Loom take up mechanism, C. F. Roper 716,282
Lumber gluing press, P. Schneider 716,288
Mail bag receiver and deliverer, W. T. Fulton et al 715,781
Mallet, G. F. Kenney 715,814
Mast arm fixture, swinging jointed, E. N. Davis 716,333
Match box, E. G. Nordblom 716,088
Matrices, producing, I. Kitsee 716,053
Mattress making machine, D. Wagner 716,354
Measuring instrument, electric, R. H. Read 716,103
Mechanical movement, L. D. Gibson 716,028
Mechanical movement, M. W. Hibbard 716,038
Metal finishing machine, strip, C. C. Webster 716,322
Metal to molds, apparatus for supplying molten, C. C. Webster 716,320, 716321
Meter. See Electric meter.
Micrometer gage, A. Rieffel 716,279
Milk or cream cooling apparatus, E. G. N. Salenius 716,112
Mining machine, coal, W. S. Bogle 716,181
Moistening device, H. M. Cloude 716,191
Molding machine, Bradley & Gilbert 715,964
Mop, floor, J. M. Michaud 716,262
Mortising machine, W. B. Reasoner 715,864
Motor, B. V. Szabo 716,143
Motor control system, F. E. Case 716,189
Motor controller, Krause & Bolen, reissue 12,064
Motors, vibration equalizing support for, A. Bochet 715,954
Mower, lawn, C. Zickler 716,164
Multicircuit generators, regulating, H. H. Wait 716,355
Multicircuit generators, regulating mechanism for, H. H. Wait 716,356
Nail making machine, J. H. Goetsche 716,030
Nut lock, W. A. Somerby 715,891
Nut lock, O. Feher 716,018
Nut lock, W. H. Nelson 716,085
Nut lock, F. Peterson 716,095
Nut lock, A. A. & E. L. Golden 716,218
Oil burner, E. R. Waterman 715,912
Oil burner, W. S. Jenkins 716,049
Oil burner, C. W. Sievert 716,121
Oil heater, S. B. Morss 715,836
Oils or the distillates or residuals thereof, treating mineral, Stewart-Wallace & Cowell 716,132
Oiling apparatus, windmill, S. W. Scott 716,292
Ore concentrating table, W. G. Dodd 716,205
Outlet or junction box, M. F. Whiton 715,917
Oven, oil heated, C. H. Higgins 716,230
Oyster shucking or oyster opening knife, Cooley & Bishop 715,988
Packaging machine, W. H. Doble 716,007
Pail, milk, J. B. Locke 716,256
Paint, antifouling, T. H. Denney 715,763
Palette, W. A. Sussmilch 716,140
Paneled member for sheet-metal structure, P. M. Wege 716,154
Paper box, W. G. Haas 715,789
Paper fastener, L. C. Cox 715,992
Paper feeding and stencil printing apparatus, automatic, A. B. Dick 715,764
Paper lifting mechanism, Tuck & Wassmann 715,905
Paper packing machine, C. J. Bradbury 715,749
Peeling machine, fruit, L. F. Graham 715,783
Pen attachment, fountain, J. A. Hamilton 716,224
Pencil sharpener, D. F. Oliver 715,848, 715,849
Photographic print washer, A. Van Hoorn 715,908
Photographic printing frame, W. G. Wood 715,923
Photographs or other card holder, W. R. Magie 716,074
Piano, tremolo, P. Pomero 715,860
Pianos, combined touch regulating and mute attachment for, Harriss & Kendall 716,034
Pin clasp, H. T. Igelstrom 715,808
Pipe, apparatus for drawing butt weld, P. Patterson 715,857
Pipe coupling, A. G. Mersing 716,260
Pipe coupling, duplex, J. J. Reilly 716,104
Pipe, drawing butt weld, P. Patterson 715,856
Pipe hanger, J. Collis 716,192
Pipe stopper and tobacco tamper, J. S. von Nieda 716,269
Planter, Cotton, Brown & Livingston 716,185
Plants, poison distributer for growing, E. Zedlitz 715,929
Plaster, blister, E. W. McAllister 716,265
Plastic materials, machine for forming interior of, F. M. Locke 716,343
Plastic surfaces, means for ornamenting, E. P. Brandt 715,965
Playing ball, F. H. Richards ..... 716,347 to 716,349
Pliers, H. L. White 715,915
Plow, subsoil, N. B. Cash 715,981
Plumb, level and square, combined, A. M. Bennett 715,946
Pneumatic despatch tube carrier, E. A. Fordyce 716,213
Pneumatic despatch tube system, E. A. Fordyce 716,212
Pocket book, J. T. Jagodnigg 715,809
Powders, machine for feeding and wrapping, F. A. Robinson 716,281
Power controlling device, R. Wick 715,918
Press. See Embossing press.
Printer's quoin, H. P. Hamel 715,790
Printing and addressing machine, combined, Runyan & Levering 715,874
Printing machine inking mechanism, T. M. North 715,847
Printing machine inking mechanism, J. White 715,916
Printing machine inking mechanism, T. M. North 716,089
Printing machine, strip, H. C. Lavery 716,064
Protractor, bevel, C. H. Barnes 716,170
Pulley, split, C. H. Bicalky 715,950
Pulp engine, T. Bassler 716,172
Pump, C. G. Nyberg 716,090
Pump, centrifugal, S. W. Luitwieler 715,825
Pump or exhaust, vacuum, T. A. Rose et al. 716,110
Pumping apparatus, water, G. J. Roberts 715,871
Punching bag apparatus, G. Yoerger 716,163
Puncture healing compound, Grant & Chester 715,784
Racking device, Rhoades & Hamrick 716,346
Radiator, G. C. Hawkins 716,228
Rail joint, M. E. Streepy 716,307
Rail joint nut lock, E. B. Murray 716,079
Rails, device for preventing the creeping of, H. Dorpmuller 716,207
Railway, electric, W. B. Potter 716,101
Railway, electric, E. A. Sperry 716,125
Railway frog heel riser, F. B. Bradley 715,750
Railway, logging, J. W. Boyd 715,963
Railway signaling system, H. Bezer, 716,178, 716,179
Railway track structure, C. B. Voynow 716,353
Ramrod, gun rest, and bayonet, combined, J. Wheeler 716,158
Reaping machine attachment, I. E. Shumaker 716,120
Refrigerator building, H. T. Myers 716,344
Rein holder, wheel operated, L. Huenke 716,233
Retort charging apparatus, J. De Brouwer 716,201
Rheostat, F. Mackintosh 715,827
Rheostat, J. L. Hall 716,222
Riveting machine, W. J. Whalen 716,156
Rock drill, F. Coyle 715,993
Rod coupling, P. Carolan 715,976
Rolling machine, car wheel, H. W. Fowler 715,777
Rolling machine, gear, W. L. Jones 716,241
Rolling mill guide, J. H. Mellors 716,259
Roof, H. N. Hansen 716,225
Rotary engine, J. A. Grove 715,788
Rotary engine, W. E. Troutman 715,904
Rotary engine, W. P. Allen 715,933
Rotary engine, S. E. Carothers 715,977
Rowing mechanism, bow facing, D. R. Sheen 715,882
Rule, measuring, J. A. & F. L. Fraut 716,150
Rule or straight edge, folding, J. Wurschmidt 715,925

(*Continued on page 472*)

Poor time has its ending — **Good time has its beginning**



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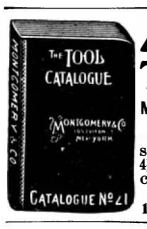

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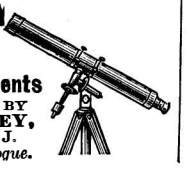

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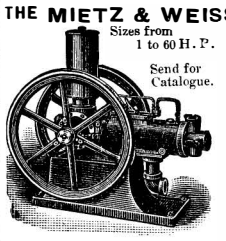

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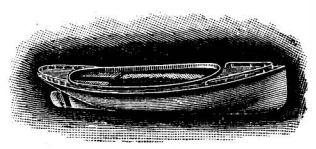
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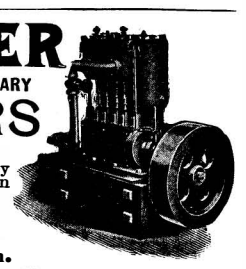

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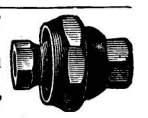

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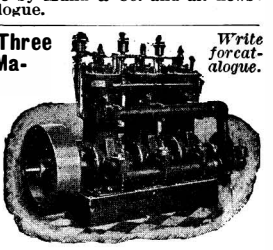

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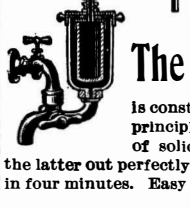

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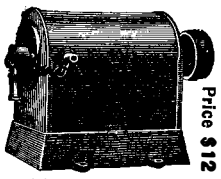

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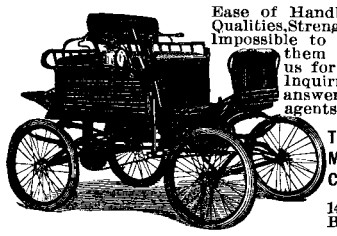
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Wagon reach, Crampton & Price 715,994
Warm air register, T. E. Hunt 715,806
Washboard, W. Boecker 715,957
Washing machine gearing, L. Faul 716,017
Waste pipe trap, White & Daub 716,326
Watch barrel, L. A. Erickson 716,013
Water closet and flushing reservoir, combined, N. B. Wales 716,315
Watchmaker's material holder, P. C. Hall 716,223
Water heater, C. W. O'Neill 716,271
Water meter guard, A. G. De Waldo 716,204
Water tube boiler, C. P. Altmann 715,737
Water tube boiler, R. Hanson, et al 716,032
Wedge, C. J. Grellner 715,786
Welding furnace, tube, P. Patterson 715,855
Welding, spring pulling hook for use in butt, E. E. Quimby 715,862
Well boring device, R. L. Landry 716,062
Wheel. See Spring wheel.
Wheel rim, W. Friedrich 715,780
Winch, H. A. L. Barry 715,742
Wind motor, J. M. Cochran 715,985
Window cleaner, C. A. Wheeler 716,157
Window frame and sash, C. B. Schilling 716,286
Wire chasing or marking machine, H. R. Fenner 715,774
Wire cutting and straightening machine, J. Kelley, et al 716,051
Wire stretcher, N. P. Nelson 715,846
Wire stretcher, B. Myers 716,080
Wrench, Case & Vincent 715,980
Wrench, E. Dauer 716,197
Wrench, I. De Ford 716,202
Zinc ores, treatment of, Ellershausen & Western 715,771

DESIGNS.

Hot water bag, etc., V. C. Van't Woud 36,172
Jug or similar article, C. J. Noke 36,171
Pitcher or similar article, J. W. Collins 36,170
Spoons, forks, etc., handle for, C. A. Bennett 36,169
Stone, cut, E. G. H. Schenck 36,167
Stove, gas, J. C. Foster 36,173
Watch fob, F. I. Gorton 36,168

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Asthma cures, Open Door Ashma Cure Co... 39,480
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Corsets, Kops Bros. 39,470
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Food products, certain named, S. M. Isbell & Co. 39,489
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Hats, interior trimmings for ladies' and misses', Roth & Appel 39,469
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Laundry machines, certain named, American Wringer Co. 39,501
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Medical effervescent preparation, W. B. Hopkins 39,482
Medicine, certain named, R. F. Celeska ... 39,481
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Oils, cotton seed, Southern Cotton Oil Co. 39,496, 39,497
Paper, carbon, Mittag & Volger 39,467
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Soap, scouring, Floridine Mfg. Co. 39,495
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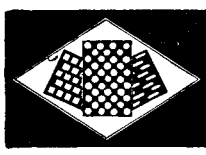
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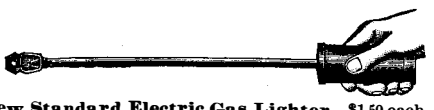
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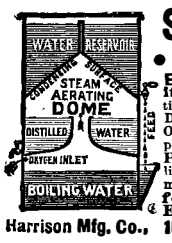

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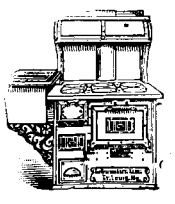
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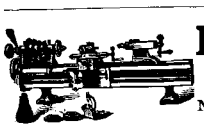

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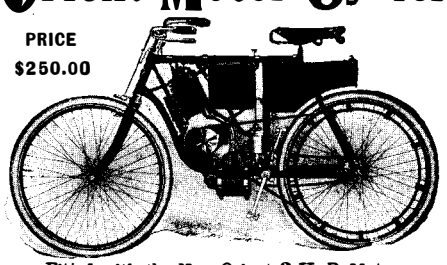

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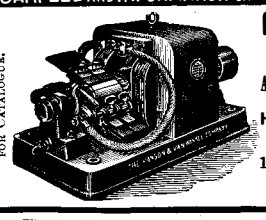

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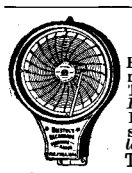

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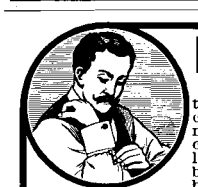

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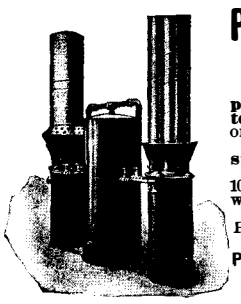

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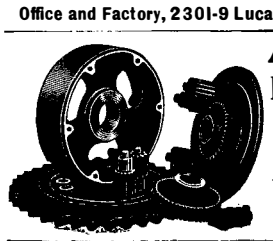

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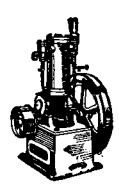

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